BIRD'S-EYE VIEW OF THE DOUBLE LOCKS AT GATUN. TOTAL RISE FROM SEA LEVEL TO LAKE LEVEL, 85 FEET.

Scientific American Reference Book

Edition *of* 1914

Compiled and Edited

by

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For Part I. Statistical Information

Editor of Scientific American Cyclopedia of Formulas
Scientific American Handbook of Travel, Etc.
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and

A. RUSSELL BOND

For Part II. Scientific Information

Editor of Handyman's
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PREFACE.

The Editorial staff of the "Scientific American" receives annually about 15,000 inquiries covering a wide range of topics—no field of human achievement or of natural phenomena is neglected. The information sought for, in many cases, cannot be readily found in text-books or works of reference. The need of a compendium of useful information presented itself some twenty years ago, and a part of the field was covered by the publication in 1901 of the "Scientific American Cyclopedia of Receipts, Notes, and Queries," of which over 25,000 copies were sold. This book becoming obsolete in time was supplanted by its successor, the "Scientific American Cyclopedia of Formulas," issued in 1911. There was, however, another field which was not covered: the public, or at least the public of the "Scientific American," demanded something which did not exist—they wanted a book which should deal with a vast range of topics other than formulæ. They wanted information about the Antarctic region, the Panama route, shipping, navies, armies, railroads, population, education, patents, submarine cables, wireless telegraphy, manufactures, agriculture, mining, mechanical movements, astronomy and the weather. The Editors of the present volume felt constrained to compile such a book, which was issued in 1904, under the same title as this book. Its success was immediate, and an edition of 10,000 copies was inadequate to supply the demand. In 1905 a second large edition was issued, and was eagerly bought up by those who wished this useful companion for the desk or library. As the

figures became obsolete, it was allowed to become "out of print," and now in response to a considerable number of requests a new book is presented, following to some extent the old lines, but entirely recompiled and rewritten.

Immense masses of Government material have been digested with painstaking care by competent statisticians, and the result will, in the judgment of the Editors, fully warrant the expenditure of considerable effort and results in the production of a unique book.

It is perhaps necessary to call attention to the fact that there are certain inconsistencies in the tables. In procuring the figures, for example, from different bureaus and departments of the Government, with reference to any subject, it is found that statistics vary in certain particulars. These differences are due to the different methods of tabulation or to different points of view. In many cases these discrepancies are noted in this book, to prevent the reader from forming erroneous conclusions. These cases must not be regarded as errors, and an attempt has been made to give, wherever possible, the date of the figures and the authority. Every available space has been taken up with useful information, whether germane to the chapter or not.

The debt for advice and help is a heavy one. The compilation of this or any similar one would be impossible without the co-operation of many Government officials. Our thanks are especially due to Dr. Falkner, late Assistant Director of the Census, and to the Hon. E. Dana Durand, Director of the Census; the Hon. O. P. Austin, late Chief of the Bureau of Statistics and now Assistant-Chief of the new Bureau of Domestic and Foreign Commerce, and to Mr. N. Eckhardt, Jr., of his office; to the Hon. Eugene Tyler Chamberlain, Commissioner of Navigation; to Captain T. M. Potts, of the United States

Navy; to Major J. D. Leitch, U. S. A., Secretary of the War College Division; to Mr. C. F. Talman, of the Weather Bureau, for his condensed chapter on the weather; to Senator Wm. Alden Smith; to Mr. Slason Thompson, of the Bureau of Railway News and Statistics; to the Hon. S. B. Donnelly, Public Printer; to Dr. J. A. Holmes, Chief of the Bureau of Mines; to the Hon. Frank H. Hitchcock, Postmaster-General; to Dr. A. F. Zahm; to Dr. W. W. Share; to Dr. Geo. F. Kunz; to Mr. Perry B. Turpin; to Dr. F. L. Hoffman, Statistician of the Prudential Life Insurance Co.; to Captain J. L. Jayne, U. S. N., Superintendent of the U. S. Naval Observatory; to Captain A. W. Lewis, of the Associated Press; to Mr. E. Justice, of the North German Lloyd Steamship Co.; to the painstaking assistants, Miss Henrietta von Tobel and Mr. Albert S. Regula; and to a host of other friends whose help was invaluable. A number of interesting comparisons in line are from Prof. A. L. Hickmann's Geographical-Statistical Universal Atlas and Philips' Chamber of Commerce Atlas. Acknowledgment is made for matter from The American Almanac and Year Book, The World Almanac and the Chicago Daily News Almanac and Year Book, The Statistical Abstract of the United States, and the publications of the Census. Many items are credited where used.

New York,
October 15, 1912.

PREFACE TO FOURTH EDITION.

The edition for 1914 has been brought up to date. The errors found were trifling, so that it is hoped that the verdict of users of this edition, as well as the press, will be favorable. Editions of a statistical work aggregating 35,000 are rare.

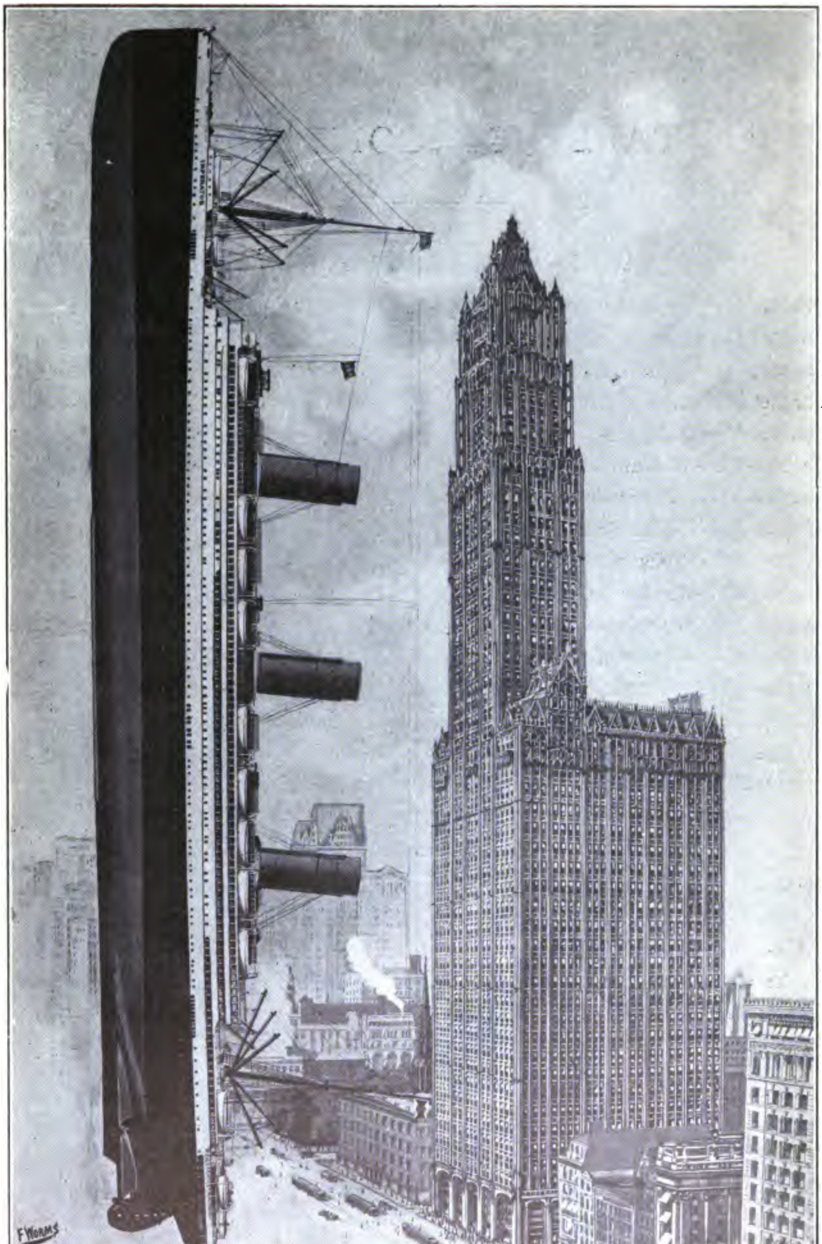
New York,
October 22, 1913.

TABLE OF CONTENTS.

PART I.—STATISTICAL INFORMATION.

PART II.—SCIENTIFIC INFORMATION.

NOTE.—A complete Table of Contents is of little value where a complete Index is provided. Those interested in a subject will find little hardship in perusing the whole chapter devoted to it.



THE LONGEST SHIP AND THE TALLEST BUILDING.
The "Imperator," 900 feet; Woolworth Building, 750 feet.

PART I.

STATISTICAL INFORMATION.

CHAPTER I.

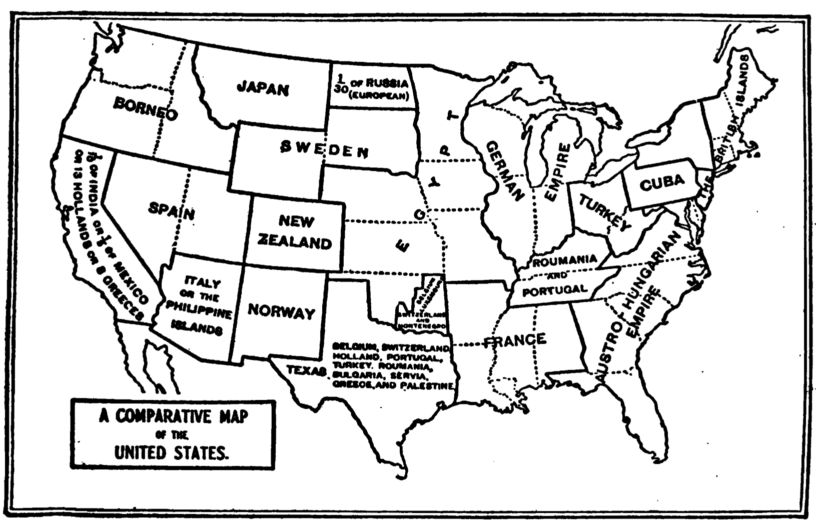
POPULATION AND SOCIAL STATISTICS.

POPULATION OF THE UNITED STATES.

AREA.	1910	1900
The United States (total area of enumeration)	**93, 402, 151**	[1] **77, 256, 630**
Continental United States	91, 972, 266	75, 994, 575
Noncontiguous territory	1, 429, 885	1, 262, 055
Alaska	64, 356	63, 592
Hawaii	191, 909	154, 001
Porto Rico	1, 118, 012	[2] 953, 243
Persons in military and naval service stationed abroad	55, 608	91, 219

[1] Includes 953,243 persons enumerated in Porto Rico in 1899.
[2] According to the census of Porto Rico taken in 1899 under the direction of the War Department.

COMPARATIVE AREA OF THE UNITED STATES AND FOREIGN COUNTRIES.



PROGRESS OF THE UNITED STATES IN ITS AREA, POPULATION, AND MATERIAL INDUSTRIES.

Items.		1790.	1850.	1870.	1900.	1912.
Area[1]	sq. miles	867,980	2,997,119	3,026,789	3,026,789	3,026,789
Population[2]		3,929,214	23,191,876	38,558,371	75,994,575	95,410,503
Population[2]	per sq. mile	4.79	7.88	12.96	25.55	32.08
Wealth[3,4]	dollars	...	7,135,780,000	30,068,518,000	88,517,306,775	[5]107,104,212,000
Wealth per capita[3,4]	dollars	...	307.69	779.83	1,164.79	[5]1,310.11
Debt, less cash in Treasury[6]	dollars	[7]75,463,477	63,452,774	2,331,169,956	1,107,711,258	1,027,574,697
Debt, per capita	dollars	[7]18.86	2.74	60.46	14.58	10.74
Interest-bearing debt[8]	dollars	[7]75,463,477	63,452,774	2,046,455,722	1,023,478,860	963,776,770
Annual interest charge	dollars	[9]1,177,863	3,782,393	118,784,960	33,545,130	22,787,084
Interest per capita	dollars	[9]0.29	0.16	3.08	0.44	0.24
Gold coined	dollars	[10]71,485	31,981,739	23,198,788	99,272,943	17,498,523
Silver coined	dollars	[10]370,684	1,866,100	1,378,256	36,345,321	7,340,995
Gold in circulation[11]	dollars	...	147,395,456	25,000,000	610,806,472	[12]610,724,154
Silver in circulation[11]	dollars				142,050,334	[12]215,373,772
Gold certificates in circulation	dollars	...	...	...	200,733,019	943,435,618
Silver certificates in circulation	dollars	...	...	...	408,465,574	469,224,400
U. S. notes in circulation	dollars	...	...	324,962,638	313,971,545	337,697,321
National bank notes in circulation	dollars	...	...	288,648,081	300,115,112	705,142,259
Miscellaneous currency[13]	dollars	...	131,366,526	36,602,075	79,008,942	2,915,570
Circulation of money	dollars	...	278,761,982	675,212,794	2,055,150,998	[12]3,284,515,094
Per capita	dollars	...	12.02	17.50	26.93	[12]34.34
National banks	number	...	...	1,612	3,732	7,372
Capital	dollars	...	...	427,235,701	621,536,461	1,033,570,675
Bank clearings, New York	dollars	...	...	27,804,539,406	51,964,588,564	96,672,301,000
Total, United States	dollars	...	...	...	84,582,450,081	168,506,362,000
Individual deposits, national banks	dollars	...	...	542,261,563	2,458,092,758	5,825,461,163
Deposits in savings banks	dollars	...	43,431,130	549,874,358	2,389,719,954	4,451,818,523
Depositors, savings banks	number	...	251,354	1,630,846	6,107,083	10,010,304
Farms and farm property[3]	dollars	...	3,967,343,580	[14]8,944,857,749	[15]20,439,901,164	[16]40,991,449,090
Farm products, value[3]	dollars	...	...	[14]1,958,030,927	4,417,069,973	[17]8,498,311,000
Manufacturing establishments[3]	number	...	123,025	252,148	512,254	[18]268,291
Value of products[3]	dollars	...	1,019,106,616	4,232,325,442	13,004,400,143	[18]20,672,051,870
Receipts—ordinary[19]	dollars	[9]4,409,951	43,592,889	395,959,834	567,240,852	691,778,465
Customs	dollars	[9]4,399,473	39,668,686	194,538,374	233,164,871	311,321,672
Internal revenue	dollars	[22]208,943	...	184,899,756	295,327,927	[21]321,612,200
Disbursements—ordinary[22]	dollars	[9]3,097,453	40,948,383	293,657,005	487,713,792	654,553,963
War	dollars	[9]632,804	9,687,025	57,655,675	134,774,768	148,795,422
Navy	dollars	[23]61,409	7,904,725	21,780,230	55,953,078	135,591,956
Pensions	dollars	[9]175,814	1,866,886	28,340,202	140,877,316	153,590,456
Interest on public debt	dollars	[9]1,177,863	3,782,393	129,235,498	40,160,333	22,616,300
Imports of merchandise	dollars	23,000,000	173,509,526	435,958,408	849,941,184	1,653,264,934
Per capita	dollars	5.85	7.48	[24]11.06	10.93	17.07
Exports of merchandise	dollars	20,205,156	144,375,726	392,771,768	1,394,483,082	2,204,322,409
Per capita	dollars	5.14	6.23	[25]9.77	17.76	22.41

PROGRESS OF THE UNITED STATES IN ITS AREA, POPULATION, AND MATERIAL INDUSTRIES—Continued.

Items.		1790.	1850.	1870.	1900.	1912.
Imports—Silk, raw	pounds			583,589	11,259,310	21,609,520
Rubber, crude	pounds			9,624,098	49,377,138	110,210,173
Tin plates	pounds			150,932,768	147,963,804	6,613,253
Iron, steel, manufactures of	dollars	115,980	20,145,067	40,273,682	20,478,728	26,676,056
Domestic exports:						
All manufactures	dollars		23,223,106	70,040,845	484,846,235	1,020,417,687
Iron and steel manufactures	dollars		1,953,702	13,483,163	121,913,548	268,154,262
Farm animals—Value	dollars		544,180,516	1,524,960,149	2,228,123,134	[26]6,501,783,000
Cattle	number		17,778,907	25,484,100	43,902,414	[26]56,527,000
Horses	number		4,336,719	8,248,800	13,537,524	[26]20,567,000
Sheep	number		21,773,220	40,853,000	41,883,065	[26]54,482,000
Mules	number		559,331	1,179,500	2,086,027	[26]4,386,000
Swine	number		30,354,213	26,751,400	37,079,356	[26]61,178,000
Production of gold	dollars		50,000,000	50,000,000	79,171,000	[27]91,685,168
Silver, commercial value	dollars		50,900	16,434,000	35,741,100	[27]33,679,786
Coal	tons		6,266,233	29,496,154	240,789,310	[27]491,071,429
Petroleum	gallons			220,951,290	2,672,062,218	[27]9,346,621,268
Pig iron	tons		563,755	1,665,179	13,789,242	29,726,937
Steel	tons			68,750	10,188,329	31,251,303
Tin plates	pounds				849,004,022	2,157,055,000
Copper	tons		650	12,600	270,588	[27]557,589
Wool	pounds		52,516,959	162,000,000	288,636,621	304,043,400
Wheat	bushels		100,485,944	235,884,700	522,229,505	730,267,000
Corn	bushels		592,071,104	1,094,255,000	2,105,102,516	3,124,746,000
Cotton	running bales	6,667	2,454,442	4,352,317	10,245,602	14,090,863
Cane sugar	pounds		247,577,000	87,043,000	322,549,011	723,840,000
Sugar consumed	pounds			1,261,941,665	4,477,175,236	7,864,248,131
Cotton consumed	500-pound bales	11,000	422,626	1,026,583	3,603,516	[28]5,181,826
Domestic cotton exported	pounds	[29]2,027	638,381,604	958,558,523	3,100,583,188	5,535,125,429
Railways in operation	miles		9,021	52,922	198,964	[28]254,732
Passengers carried	number				576,831,251	[28]997,409,882
Freight carried 1 mile	tons				141,596,551,161	[28]253,783,701,839
Revenue, ton per mile	cents				.729	[28]0.757
Passenger cars	number				34,713	[28]49,818
Other cars	number				1,416,125	[28]2,309,517
American vessels—Built[30]	tons	[31]56,679	279,255	276,953	393,790	232,669
Trading, domestic, etc	tons	132,123	1,949,743	2,729,707	4,338,145	6,782,082
Trading, foreign, etc	tons	346,254	1,585,711	1,516,800	826,694	932,101
On Great Lakes	tons		198,266	684,704	1,565,587	2,949,924
Vessels through "Soo" Canal	tons			690,826	22,315,834	56,736,807
Commercial failures	number			3,540	10,774	15,542
Amount of liabilities	dollars			88,242,009	138,495,673	203,117,391
Post offices	number	75	18,417	28,492	76,688	58,729

PROGRESS OF THE UNITED STATES IN ITS AREA, POPULATION, AND MATERIAL INDUSTRIES—Continued.

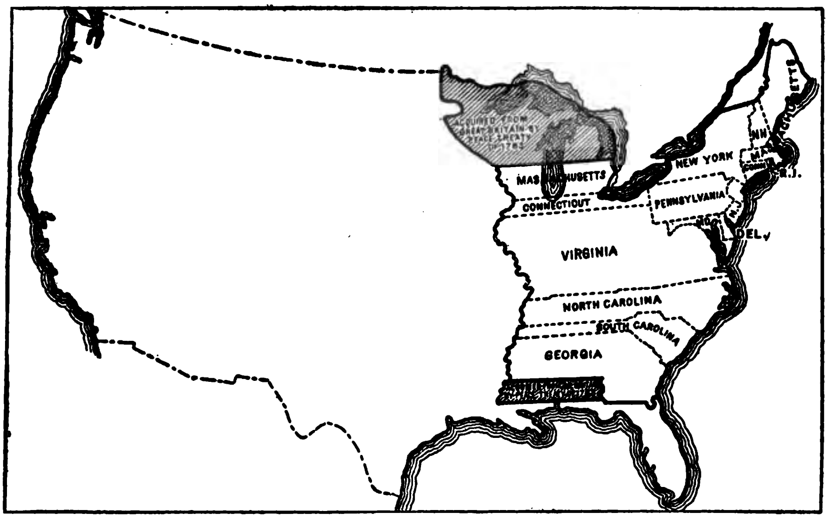
Items.	1790.	1850.	1870.	1900.	1912.
Receipts P. O. Dept................dollars.....	71,296	5,499,984	19,772,221	102,354,579	246,744,016
Telegrams sent[32]..................number....	....	....	9,157,646	63,167,783	[33]90,000,000
Newspapers, etc.[34]................number....	....	2,526	5,871	20,806	22,837
Public schools, salaries.............dollars.....	....	....	37,832,566	137,687,746	[35]266,678,471
Patents issued.....................number....	....	993	13,333	26,499	37,731
Immigrants arrived[36]..............number....	....	369,980	387,203	448,572	838,172

[1]Exclusive of Alaska and islands belonging to the United States.
[2]Census figures, relating to Continental United States; the figures for 1912 represent an estimate. [3]Census figures.
[4]True valuation of real and personal property. [5]1904. [6]1791 to 1850, outstanding principal of the public debt. January 1. [7]1791.
[8]Figures for the years 1791 to 1850 include the total public debt. [9]1791 (34 months). [10]1793-1795.
[11]Gold and silver can not be stated separately prior to 1876. From 1862 to 1875, inclusive, gold and silver were not in circulation except on the Pacific coast, where it is estimated that the average specie circulation was about $25,000,000, and this estimate is continued for the three following years under the head of gold. After that period gold was available for circulation.
[12]As the result of special investigation by the Director of the Mint a reduction of $135,000,000 was made in the estimate of gold coin in circulation on July 1, 1907, as compared with the basis of previous years, and on September 1, 1910, a reduction of $9,700,000 was made in the estimate of silver coin.
[13]Includes notes of Bank of United States; State-bank notes; demand notes of 1862 and 1863; fractional currency, 1863 to 1878; Treasury notes of 1890, 1891 to date; and currency certificates, act of June 8, 1872, 1892 to 1900.
[14]Gold values, being 80 per cent of currency values reported. Figures of products include betterments and additions to live stock.
[15]Includes value of buildings, $3,556,639,496. The Twelfth Census was the first to collect statistics of buildings on farms.
[16]Figures relate to 1910 and include value of buildings, $6,325,451,528.
[17]Gross value of all farm products. Figures are not comparable with those of previous censuses for reasons of which see census reports.
[18]Figures relate to the census of 1910, cover the calendar year 1909, and are exclusive of neighborhood industries and hand trades, included in previous years.
[19]"Ordinary receipts" include receipts from customs, internal revenue, direct tax, public lands, and "miscellaneous," but do not include receipts from loans, premiums, Treasury notes, or revenues of Post Office Department.
[20]1792. [21]Includes corporation tax, $28,583,304.
[22]"Ordinary disbursements" include disbursements for War, Navy, Indians, pensions, payments for interest, and "miscellaneous," but do not include payments for premiums, principal of public debt, or disbursements for postal service paid from revenues thereof.
[23]1794. [24]Imports for consumption after 1850.
[25]Domestic exports only after 1850.
[26]January 1, 1913.
[27]Preliminary figures.
[28]1911.
[29]Equivalent 500-pound bales.
[30]Includes canal boats and barges prior to 1870.
[31]1797.
[32]The figures relate to the Western Union only, and after 1900 do not include messages sent over leased wires or under railroad contracts.
[33]Estimated.
[34]1850, from census of 1880; 1870 to 1900, from Rowell's Newspaper Directory; after 1900 from Ayer's American Newspaper Annual. Figures for 1912 include outlying possessions.
[35]Includes salaries of teachers only. The figures are for 1911.
[36] 1850, total alien passengers arrived, 15 months ended December 31; after 1850, fiscal years ending June 30.

AREA OF THE UNITED STATES.

ACCESSION.	Gross area in square miles.	ACCESSION.	Gross area in square miles.
Continental U. S.	**3,026,789**	**Outlying possessions**	**716,517**
Area of U. S. in 1790[1]	892,135	Alaska, 1867	590,884
Louisiana Purchase, 1803	827,987	Hawaii, 1898	6,449
Florida, 1819	58,666	Philippine Islands, 1899	115,026
Territory gained through Treaty with Spain, 1819	13,435	Porto Rico, 1899	3,435
Texas, 1845	389,166	Guam, 1899	210
Oregon, 1846	286,541	Samoa, 1900	77
Mexican Cession, 1848	529,189	Panama Canal Zone, 1904	436
Gadsden Purchase, 1853	29,670		

[1] Includes the drainage basin of the Red River of the North, not a part of any acquisition, but previously considered a part of the Louisiana Purchase.



THE THIRTEEN ORIGINAL STATES, WITH THE ACCESSIONS OF TERRITORY GRANTED BY THE TREATY OF 1783 WITH GREAT BRITAIN.

TIDES.

Tides are caused by the gravitational attraction or pull of the sun and moon upon the water and upon the earth itself. The close relation which the tides of high water bear to the times of the moon's meridian passage shows that the moon's influence in rising tides is much greater than that of the sun; it has been estimated that it is two and one-half times as great. The result of this attraction of the moon is to draw or heap up the water, in the parts of the earth nearest it, successively towards it. The surface of the earth rises and falls twice in a lunar day of about 24 hours and 52 minutes. The tides do not always rise to the same height, but every fortnight, after the new and full moon, they become much higher than they were in the alternate weeks. These high tides are called spring tides, and the low ones neap tides.

-POPULATION OF THE UNITED STATES AT EACH CENSUS, 1790 TO 1910: BY STATES AND GEOGRAPHIC DIVISIONS.

[Source: Reports of the Bureau of the Census, Department of Commerce and Labor.]

State.	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910
Alabama				127,901	309,527	590,756	771,623	964,201	996,992	1,262,505	1,513,401	1,828,697	2,138,093
Arizona									9,658	40,440	88,243	122,931	204,354
Arkansas			1,062	14,273	30,388	97,574	209,897	435,450	484,471	802,525	1,128,211	1,311,564	1,574,449
California							92,597	379,994	560,247	864,694	1,213,398	1,485,053	2,377,549
Colorado								34,277	39,864	194,327	413,249	539,700	799,024
Connecticut	237,946	251,002	261,942	275,248	297,675	309,978	370,792	460,147	537,454	622,700	746,258	908,420	1,114,756
Delaware	59,096	64,273	72,674	72,749	76,748	78,085	91,532	112,216	125,015	146,608	168,493	184,735	202,322
District of Columbia		14,093	24,023	33,039	39,834	43,712	51,687	75,080	131,700	177,624	230,392	278,718	331,069
Florida					34,730	54,477	87,445	140,424	187,748	269,493	391,422	528,542	752,619
Georgia	82,548	162,686	252,433	340,989	516,823	691,392	906,185	1,057,286	1,184,109	1,542,180	1,837,353	2,216,331	2,609,121
Idaho									14,999	32,610	88,548	161,772	325,594
Illinois			12,282	55,211	157,445	476,183	851,470	1,711,951	2,539,891	3,077,871	3,826,352	4,821,550	5,638,591
Indiana		5,641	24,520	147,178	343,031	685,866	988,416	1,350,428	1,680,637	1,978,301	2,192,404	2,516,462	2,700,876
Iowa						43,112	192,214	674,913	1,194,020	1,624,615	1,912,297	2,231,853	2,224,771
Kansas								107,206	364,399	996,096	1,428,108	1,470,495	1,690,949
Kentucky	73,677	220,955	406,511	564,317	687,917	779,828	982,405	1,155,684	1,321,011	1,648,690	1,858,635	2,147,174	2,289,905
Louisiana			76,556	153,407	215,739	352,411	517,762	708,002	726,915	939,946	1,118,588	1,381,625	1,656,388
Maine	96,540	151,719	228,705	298,335	399,455	501,793	583,169	628,279	626,915	648,936	661,086	694,466	742,371
Maryland	319,728	341,548	380,546	407,350	447,040	470,019	583,034	687,049	780,894	934,943	1,042,390	1,188,044	1,295,346
Massachusetts	378,787	422,845	472,040	523,287	610,408	737,699	994,514	1,231,066	1,457,351	1,783,085	2,238,947	2,805,346	3,366,416
Michigan			4,762	8,896	31,639	212,267	397,654	749,113	1,184,059	1,636,937	2,093,890	2,420,982	2,810,173
Minnesota							6,077	172,023	439,706	780,773	1,310,283	1,751,394	2,075,708
Mississippi		8,850	40,352	75,448	136,621	375,651	606,526	791,305	827,922	1,131,597	1,289,600	1,551,270	1,797,114
Missouri			19,783	66,586	140,455	383,702	682,044	1,182,012	1,721,295	2,168,380	2,679,185	3,106,665	3,293,335
Montana									20,595	39,159	142,924	243,329	376,053
Nebraska								28,841	122,993	452,402	1,062,656	1,066,300	1,192,214
Nevada								6,857	42,491	62,266	47,355	42,335	81,875
New Hampshire	141,885	183,858	214,460	244,161	269,328	284,574	317,976	326,073	318,300	346,991	376,530	411,588	430,572
New Jersey	184,139	211,149	245,562	277,575	320,823	373,306	489,555	672,035	906,096	1,131,116	1,444,933	1,883,669	2,537,167
New Mexico							61,547	93,516	91,874	119,565	160,282	195,310	327,301
New York	340,120	589,051	959,049	1,372,812	1,918,608	2,428,921	3,097,394	3,880,735	4,382,759	5,082,871	6,003,174	7,268,894	9,113,614
North Carolina	393,751	478,103	555,500	638,829	737,987	753,419	869,039	992,622	1,071,361	1,399,750	1,617,949	1,893,810	2,206,287
North Dakota								(1)	(2)	(2)	190,983	319,146	577,056
Ohio		45,365	230,760	581,434	937,903	1,519,467	1,980,329	2,339,511	2,665,260	3,198,062	3,672,329	4,157,545	4,767,121
Oklahoma											[3] 258,657	[3] 790,391	1,657,155

Oregon							13,294	52,465	90,923	174,768	317,704	413,536	672,765
Pennsylvania	434,373	602,365	810,091	1,049,458	1,348,233	1,724,033	2,311,786	2,906,215	3,521,951	4,282,891	5,258,113	6,302,115	7,665,111
Rhode Island	68,825	69,122	76,931	83,059	97,199	108,830	147,545	174,620	217,353	276,531	345,506	428,556	542,610
South Carolina	249,073	345,591	415,115	502,741	581,185	594,398	668,507	703,708	705,606	995,577	1,151,149	1,340,316	1,515,400
South Dakota								[1]4,837	[2]14,181	[2]135,177	348,600	401,570	583,888
Tennessee	35,691	105,602	261,727	422,823	681,904	829,210	1,002,717	1,109,801	1,258,520	1,542,359	1,767,518	2,020,616	2,184,789
Texas							212,592	604,215	818,579	1,591,749	2,235,527	3,048,710	3,896,542
Utah							11,380	40,273	86,786	143,963	210,779	276,749	373,351
Vermont	85,425	154,465	217,895	235,981	280,652	291,948	314,120	315,098	330,551	332,286	332,422	343,641	355,956
Virginia	747,610	880,200	974,600	1,065,366	1,211,405	1,239,797	1,421,661	1,596,318	1,225,163	1,512,565	1,655,980	1,854,184	2,061,612
Washington								11,594	23,955	75,116	357,232	518,103	1,141,990
West Virginia									442,014	618,457	762,794	958,800	1,221,119
Wisconsin						30,945	305,391	775,881	1,054,670	1,315,497	1,693,330	2,069,042	2,333,860
Wyoming									9,118	20,789	62,555	92,531	145,965
Total	3,929,214	5,308,483	7,239,881	9,638,453	12,866,020	17,069,453	23,191,876	31,443,321	38,558,371	50,155,783	[4]62,947,714	75,994,575	91,972,266
Geographic divisions.[5]													
New England	1,009,408	1,233,011	1,471,973	1,660,071	1,954,717	2,234,822	2,728,116	3,135,283	3,487,924	4,010,529	4,700,749	5,592,017	6,552,681
Middle Atlantic	958,632	1,402,565	2,014,702	2,699,845	3,587,664	4,526,260	5,898,735	7,458,985	8,810,806	10,496,878	12,706,220	15,454,678	19,315,892
East North Central		51,006	272,324	792,719	1,470,018	2,924,728	4,523,260	6,926,884	9,124,517	11,206,668	13,478,305	15,985,581	18,250,621
West North Central			19,783	66,586	140,455	426,814	880,335	2,169,832	3,856,594	6,157,443	8,932,112	10,347,423	11,637,921
South Atlantic	1,851,806	2,286,494	2,674,891	3,061,063	3,645,752	3,925,299	4,679,090	5,364,703	5,853,610	7,597,197	8,857,922	10,443,480	12,194,895
East South Central	109,368	335,407	708,590	1,190,489	1,815,969	2,575,445	3,363,271	4,020,991	4,404,445	5,585,151	6,429,154	7,547,757	8,409,901
West South Central			77,618	167,680	246,127	449,985	940,251	1,747,667	2,029,965	3,334,220	4,740,983	6,532,290	8,784,534
Mountain							72,927	174,923	315,385	653,119	1,213,935	1,674,657	2,633,517
Pacific							105,891	444,053	675,125	1,114,578	1,888,334	2,416,692	4,192,304
Alaska										[6]33,426	32,052	63,592	64,356
Hawaii											[7]89,990	154,001	191,909
Porto Rico												[8]953,243	1,118,012
Military and naval[9]					[10]5,318	[10]6,100						91,219	55,608
Grand total	3,929,214	5,308,483	7,239,881	9,638,453	12,871,338	17,075,553	23,191,876	31,443,321	38,558,371	50,189,209	63,069,756	77,256,630	93,402,151

[1] Dakota Territory.
[2] Population for that part of Dakota Territory taken to form North Dakota: 1880, 36,909; 1870, 2,405; and for that part taken to form South Dakota: 1880, 98,268; 1870, 11,776.
[3] Includes population of Indian Territory: 1890, 180,182; 1900, 392,060.
[4] Includes population (325,462) of Indian Territory and Indian reservations specially enumerated in 1890, but not included in the general report on population in 1890.
[5] For States included in each division, see note 5, p. 38.
[6] Alaska was specially enumerated under the law, but the population was not included in the general report on population in 1880.
[7] According to the census taken as of Dec. 28, 1890, under the direction of the Hawaiian Government.
[8] According to the census of Porto Rico taken in 1899 under the direction of the War Department.
[9] Persons in the military and naval service of the United States (including civilian employees, etc.) stationed abroad, not credited to any State or Territory.
[10] Persons on public ships in the service of the United States not credited to any State or Territory, but included in the total for continental United States.

POPULATION IN 1910: BY SEX, RACE, AND NATIVITY AND PARENTAGE OF WHITES, AND BY STATES AND GEOGRAPHIC DIVISIONS.

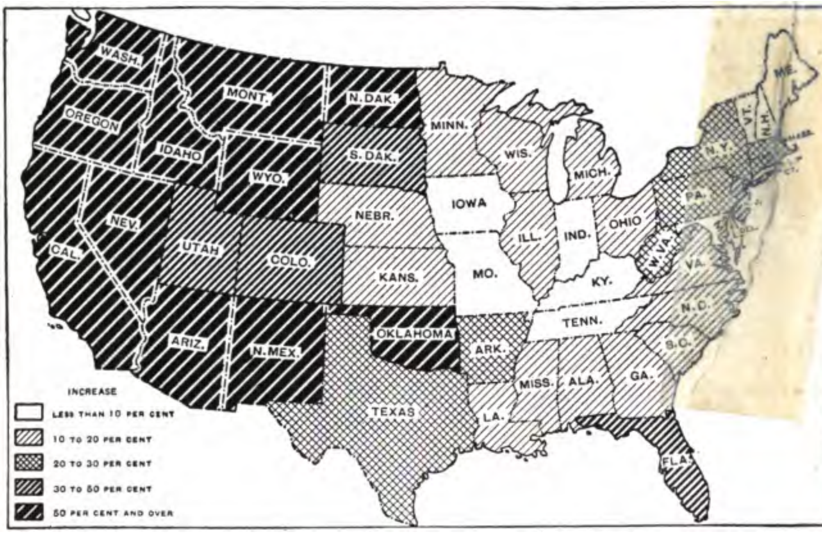
[Source: Report of the Bureau of the Census, Department of Commerce and Labor. Figures are preliminary and are subject to revision.]

State.	Sex.		Race, nativity, and parentage.							
	Male.	Female.	Native white of native parentage.	Native white of foreign parentage.	Foreign white.	Negro.	Indian.	Chinese.	Japanese.	All other.
Alabama	1,074,209	1,063,884	1,177,457	32,438	18,946	908,275	909	61	3	4
Arizona	118,582	85,772	82,480	42,175	46,844	2,067	29,201	1,236	351	....
Arkansas	810,025	764,424	1,077,509	36,608	16,913	442,891	460	59	8	1
California	1,322,973	1,054,576	1,106,533	635,970	517,319	21,645	16,371	36,197	41,324	2,190
Colorado	430,697	368,327	475,136	181,432	126,971	11,453	1,482	360	2,190	....
Connecticut	563,641	551,115	395,649	374,546	328,737	15,174	152	427	71	....
Delaware	103,435	98,887	127,809	25,873	17,421	31,181	5	29	4	....
District of Columbia	158,050	173,019	166,711	45,066	24,351	94,446	68	369	47	11
Florida	394,166	358,453	373,967	35,828	33,851	308,669	74	184	45	1
Georgia	1,305,019	1,304,102	1,391,058	25,677	15,081	1,176,987	95	219	4	....
Idaho	185,546	140,048	203,604	75,254	40,444	646	3,488	838	1,308	12
Illinois	2,911,653	2,726,938	2,600,565	1,724,489	1,201,928	109,041	188	2,104	276	....
Indiana	1,383,299	1,317,577	2,130,168	350,747	159,118	60,280	279	249	35	....
Iowa	1,148,171	1,076,600	1,303,526	632,182	273,388	15,078	471	93	30	3
Kansas	885,912	805,037	1,207,087	292,077	134,719	54,504	2,444	15	103	....
Kentucky	1,161,709	1,128,196	1,863,157	124,775	40,023	261,656	234	50	10	....
Louisiana	835,275	821,113	776,569	112,728	51,828	713,874	780	493	31	85
Maine	377,053	365,318	494,918	135,188	109,911	1,364	892	90	8	....
Maryland	644,225	651,121	766,628	191,841	104,176	232,249	55	374	23	....
Massachusetts	1,655,226	1,711,190	1,103,361	1,170,793	1,050,899	38,042	688	2,493	140	....
Michigan	1,454,534	1,355,639	1,224,841	965,217	595,200	17,115	7,519	239	40	2
Minnesota	1,108,511	967,197	575,081	941,315	542,857	7,084	9,053	250	66	3
Mississippi	905,761	891,353	757,233	19,495	9,391	1,009,487	1,253	249	2	4
Missouri	1,687,838	1,605,497	2,387,909	518,341	228,695	157,452	313	532	91	2
Montana	226,866	149,187	162,129	106,811	91,647	1,834	10,745	1,276	1,593	18
Nebraska	627,782	564,432	642,075	362,353	175,883	7,689	3,502	109	574	29

Nevada	52,551	29,324	35,313	20,996	13,102	513	5,240	900	889	22
New Hampshire	216,290	214,282	230,231	103,118	96,560	564	34	64	1	....
New Jersey	1,286,463	1,250,704	1,0[illegible]9,909	777,859	658,159	89,760	168	1,169	298	....
New Mexico	175,245	152,056	255,609	26,331	22,662	1,668	20,573	246	252	....
New York	4,584,581	4,529,033	3,230,154	3,007,507	2,729,260	134,181	6,046	5,235	1,217	14
North Carolina	1,098,471	1,107,816	1,485,705	8,855	5,953	697,843	7,851	78	2	....
North Dakota	317,554	259,502	162,461	251,256	156,138	617	6,486	39	59	....
Ohio	2,434,765	2,332,356	3,033,275	1,024,377	597,255	111,443	127	574	70	....
Oklahoma	881,573	775,582	1,310,403	94,044	40,088	137,612	74,825	137	46	....
Oregon	384,255	288,510	416,851	135,241	103,002	1,519	5,090	7,359	3,418	285
Pennsylvania	3,942,137	3,722,974	4,222,616	1,806,392	1,438,752	193,908	1,503	1,749	189	2
Rhode Island	270,359	272,251	159,821	194,646	178,031	9,529	284	266	33	....
South Carolina	751,842	763,558	661,970	11,138	6,054	835,843	331	56	8	....
South Dakota	317,101	266,787	245,665	217,478	100,628	817	19,137	120	43	....
Tennessee	1,103,491	1,081,298	1,654,606	38,367	18,460	473,088	216	43	8	1
Texas	2,017,612	1,878,930	2,602,958	361,926	240,012	690,020	702	575	341	8
Utah	196,857	176,494	171,671	131,527	63,404	1,143	3,123	373	2,105	5
Vermont	182,568	173,388	229,382	75,055	49,861	1,621	26	8	3	....
Virginia	1,035,348	1,026,264	1,325,238	37,943	26,628	671,096	539	154	14	....
Washington	658,650	483,340	585,401	282,529	241,227	6,058	10,997	2,706	12,886	186
West Virginia	644,044	577,075	1,042,107	57,638	57,072	64,173	36	90	3	....
Wisconsin	1,208,541	1,125,319	763,224	1,044,764	512,569	2,900	10,142	224	34	3
Wyoming	91,666	54,299	80,711	32,497	27,165	2,235	1,486	244	1,571	56
Total	47,332,122	44,640,144	49,488,441	18,900,663	13,343,583	9,828,294	265,683	70,944	71,722	2,936
Geographic divisions.[1]										
New England	3,265,137	3,287,544	2,613,362	2,653,346	1,813,999	66,294	2,076	3,348	268	....
Middle Atlantic	9,813,181	9,502,711	8,462,679	5,591,758	4,826,171	417,849	7,717	8,093	1,609	16
East North Central	9,392,792	8,857,829	9,752,073	5,109,594	3,066,070	300,779	18,265	8,390	455	5
West North Central	6,092,869	5,545,052	6,523,804	3,215,002	1,612,308	243,241	41,406	1,158	986	36
South Atlantic	6,134,600	6,060,295	7,341,198	439,859	290,587	4,112,487	9,054	1,553	150	12
East South Central	4,245,170	4,164,731	5,452,453	215,075	86,820	2,652,506	2,612	408	23	9
West South Central	4,544,485	4,240,049	5,767,439	605,306	348,841	1,984,397	76,767	1,264	426	94
Mountain	1,478,010	1,155,507	1,466,653	616,983	437,239	21,519	75,338	5,478	10,209	108
Pacific	2,365,878	1,826,426	2,108,785	1,053,740	861,548	29,222	32,458	46,262	57,628	2,661

CENTRE OF POPULATION.

At the time of the first census, the centre of population was 23 miles east of Baltimore, Maryland, since which time it has moved steadily westward. In 1800 it was 18 miles west of Baltimore, in 1810 40 miles northwest by west from Washington, D. C.; in 1820 16 miles north of Woodstock, Va.; in 1830 19 miles west-southwest of Moorefield, W. Va.; in 1840 16 miles south of Clarksburg, W. Va.; in 1850 23 miles southwest of Parkersburg, W. Va.; in 1860 20 miles south of Chillicothe, Ohio; in 1870 48 miles east by north of Cincinnati, Ohio; in 1890 20 miles east of Columbus, Indiana; in 1900 6 miles southeast of Columbus, Indiana; and finally, in 1910 in the city of Bloomington, Indiana. During the 120 years that the United States has existed the centre has moved over 550 miles westward, or in other words, from west latitude 76 degrees 11 minutes 12 seconds to west latitude 86 degrees 32 minutes 20 seconds.



PERCENTAGE OF INCREASE BY STATES 1900–1910.

INCREASE IN POPULATION.

CENSUS YEAR.	Population of continental United States.	INCREASE OVER PRECEDING CENSUS. Number.	INCREASE OVER PRECEDING CENSUS. Per cent.	Adjusted percentages of increase.
1910	91,972,266	15,977,691	21.0	21.0
1900	75,994,575	13,046,861	20.7	20.7
1890	62,947,714	12,791,931	25.5	24.9
1880	50,155,783	11,597,412	30.1	26.0
1870	38,558,371	7,115,050	22.6	26.6
1860	31,443,321	8,251,445	35.6	35.6
1850	23,191,876	6,122,423	35.9	35.9
1840	17,069,453	4,203,433	32.7	32.7
1830	12,866,020	3,227,567	33.5	33.5
1820	9,638,453	2,398,572	33.1	33.1
1810	7,239,881	1,931,398	36.4	36.4
1800	5,308,483	1,379,269	35.1	35.1
1790	3,929,214			

POPULATION OF CITIES

OF THE

UNITED STATES

Census of 1910

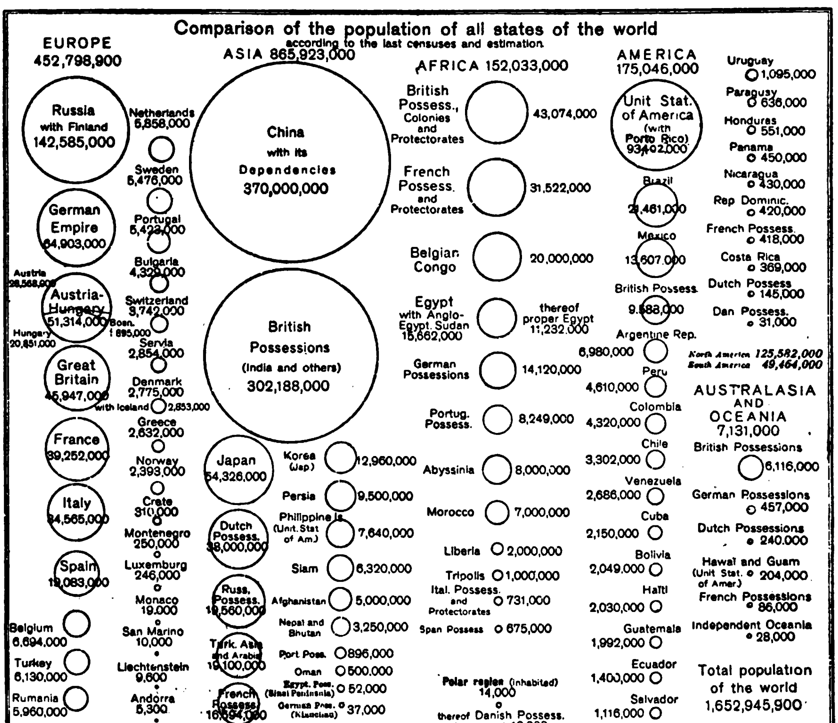
Cities of over 100,000 population

Albany, N. Y....	100,253
Atlanta, Ga......	154,839
Baltimore, Md ..	558,485
Birmingham, Ala.	132,685
Boston, Mass....	670,585
Bridgeport, Conn	102,054
Buffalo, N. Y....	423,715
Cambridge, Mass	104,839
Chicago, Ill.....	2,185,283
Cincinnati, Ohio.	364,463
Cleveland, Ohio..	560,663
Columbus, Ohio..	181,548
Dayton, Ohio....	116,577
Denver, Colo....	213,381
Detroit, Mich....	465,766
Fall River, Mass.	119,295
Grand Rapids, Mich........	112,571
Indianapolis, Ind.	233,650
Jersey City, N. J.	267,779
Kansas City, Mo.	248,381
Los Angeles, Cal.	319,198
Louisville, Ky....	223,928
Lowell, Mass....	106,294
Memphis, Tenn..	131,105
Milwaukee, Wis..	373,857
Minneapolis, Minn.........	301,408
Nashville, Tenn..	110,364
Newark, N. J....	347,469
New Haven, Ct..	133,605
New Orleans, La.	339,075
New York, N. Y.	4,766,883
Oakland, Cal....	150,174
Omaha, Neb.....	124,096
Paterson, N. J...	125,600
Philadelphia, Pa.	1,549,008
Pittsburgh, Pa...	533,905
Portland, Ore....	207,214
Providence, R. I.	224,326
Richmond, Va...	127,628
Rochester, N. Y..	218,149
St. Louis, Mo....	687,029
St. Paul, Minn...	214,744
San Francisco, Cal..........	416,912
Scranton, Pa....	129,867
Seattle, Wash....	237,194
Spokane, Wash..	104,402
Syracuse, N. Y...	137,249
Toledo, Ohio....	168,497
Washington, D.C.	331,069
Worcester, Mass.	145,986

Cities of from 25,000 to 100,000 population

Akron, Ohio........	69,067
Allentown, Pa......	51,913
Altoona, Pa........	52,127
Amsterdam, N. Y...	31,267
Atlantic City, N. J..	46,150
Auburn, N. Y.......	34,668
Augusta, Ga........	41,040
Aurora, Ill..........	29,807
Austin, Tex........	29,860
Battle Creek, Mich..	25,267
Bay City, Mich.....	45,166
Bayonne, N. J......	55,545
Berkeley, Cal.......	40,434
Binghamton, N. Y..	48,443
Bloomington, Ill....	25,768
Brockton, Mass.....	56,878
Brookline, Mass....	27,792
Butte, Mont........	39,165
Camden, N. J.......	94,538
Canton, Ohio.......	50,217
Cedar Rapids, Iowa.	32,811
Charleston, S C....	58,833
Charlotte, N. C.....	34,014
Chattanooga, Tenn.	44,604
Chelsea, Mass......	32,452
Chester, Pa........	38,537
Chicopee, Mass.....	25,401
Clinton, Iowa.......	25,577
Colorado Springs Colo.............	29,078
Columbia, S. C.....	26,319
Council Bluffs, Iowa.	29,292
Covington, Ky......	53,270
Dallas, Tex.........	92,104
Danville, Ill........	27,871
Davenport, Iowa....	43,028
Decatur, Ill.........	31,140
Des Moines, Iowa...	86,368
Dubuque, Iowa.....	38,494
Duluth, Minn......	78,466
Easton, Pa.........	28,523
East Orange, N. J...	34,371
East St. Louis, Ill...	58,547
El Paso, Tex.......	39,279
Elgin, Ill..........	25,976
Elizabeth, N. J.....	73,409
Elmira, N. Y.......	37,176
Erie, Pa...........	66,525
Evansville, Ind.....	69,647
Everett, Mass......	33,484
Fitchburg, Mass....	37,826
Flint, Mich.........	38,550
Fort Wayne, Ind....	63,933
Fort Worth, Tex....	73,312
Galveston, Tex.....	36,981
Green Bay, Wis.....	25,236
Hamilton, Ohio.....	35,279
Harrisburg, Pa......	64,186
Hartford, Conn.....	98,915
Haverhill, Mass.....	44,115
Hazleton, Pa.......	25,452
Hoboken, N. J......	70,324
Holyoke, Mass......	57,730
Houston, Tex.......	78,800
Huntington, W. Va..	31,161
Jackson, Mich......	31,433
Jacksonville, Fla....	57,699
Jamestown, N. Y....	31,297
Johnstown, Pa......	55,482
Joliet, Ill...........	34,670
Joplin, Mo..........	32,073
Kalamazoo, Mich...	39,437
Kansas City, Kans..	82,331
Kingston, N. Y.....	25,908
Knoxville, Tenn....	36,346
La Crosse, Wis.....	30,417
Lancaster, Pa.......	47,227
Lansing, Mich......	31,229
Lawrence, Mass.....	85,892
Lewiston, Me.......	26,247
Lexington, Ky......	35,099
Lima, Ohio.........	30,508
Lincoln, Nebr......	43,973
Little Rock, Ark....	45,941
Lorain, Ohio.......	28,883
Lynchburg, Va.....	29,494
Lynn, Mass........	89,336
Macon, Ga.........	40,665
McKeesport, Pa....	42,694
Madison, Wis......	25,531
Malden, Mass......	44,404
Manchester, N. H...	70,063
Meriden, Conn.....	27,265
Mobile, Ala........	51,521
Montgomery, Ala...	38,136
Mount Vernon, N. Y	30,919
Muskogee, Okla.....	25,278
Nashua, N. H......	26,005
Newark, Ohio......	25,404
New Bedford, Mass.	96,652
New Britain, Conn..	43,916
Newburgh, N. Y....	27,805
Newcastle, Pa.....	36,280
Newport, Ky.......	30,309
Newport, R. I......	27,149
New Rochelle, N. Y.	28,867
Newton, Mass......	39,806
Niagara Falls, N. Y..	30,445

Norfolk, Va.	**67,452**	**St. Joseph, Mo.**	**77,403**	**Terre Haute, Ind.**	**58,157**
Norristown, Pa.	**27,875**	**Salem, Mass.**	**43,697**	**Topeka, Kans.**	**43,684**
Ogden, Utah	**25,580**	**Salt Lake City, Utah**	**92,777**	**Trenton, N. J.**	**96,815**
Oklahoma City, Okla	**64,205**	**San Antonio, Tex.**	**96,614**	**Troy, N. Y.**	**76,813**
Orange, N. J.	**29,630**	**San Diego, Cal.**	**39,578**	**Utica, N. Y.**	**74,419**
Oshkosh, Wis.	**33,062**	**San Jose, Cal.**	**28,946**	**Waco, Tex.**	**26,425**
Pasadena, Cal.	**30,291**	**Savannah, Ga.**	**65,064**	**Waltham, Mass.**	**27,834**
Passaic, N. J.	**54,773**	**Schenectady, N. Y.**	**72,826**	**Warwick, R. I.**	**26,629**
Pawtucket, R. I.	**51,622**	**Sheboygan, Wis.**	**26,398**	**Waterbury, Conn.**	**73,141**
Peoria, Ill.	**66,950**	**Shenandoah, Pa.**	**25,774**	**Waterloo, Iowa**	**26,693**
Perth Amboy, N. J.	**32,121**	**Shreveport, La.**	**28,015**	**Watertown, N. Y.**	**26,730**
Pittsfield, Mass.	**32,121**	**Sioux City, Iowa**	**47,828**	**West Hoboken, N. J.**	**35,403**
Portland, Me.	**58,571**	**Somerville, Mass.**	**77,236**	**Wheeling, W. Va.**	**41,641**
Portsmouth, Va.	**33,190**	**South Bend, Ind.**	**53,684**	**Wichita, Kans.**	**52,450**
Poughkeepsie, N. Y.	**27,936**	**South Omaha, Nebr.**	**26,259**	**Wilkes-Barre, Pa.**	**67,105**
Pueblo Colo.	**44,395**	**Springfield, Ill.**	**51,678**	**Williamsport, Pa.**	**31,860**
Quincy, Ill.	**36,587**	**Springfield, Mass.**	**88,926**	**Wilmington, Del.**	**87,411**
Quincy, Mass.	**32,642**	**Springfield, Mo.**	**35,201**	**Wilmington, N. C.**	**25,748**
Racine, Wis.	**38,002**	**Springfield, Ohio.**	**46,921**	**Woonsocket, R. I.**	**38,125**
Reading, Pa.	**96,071**	**Stamford, Conn.**	**25,138**	**Yonkers, N. Y.**	**79,803**
Roanoke, Va.	**34,874**	**Superior, Wis.**	**40,384**	**York, Pa.**	**44,750**
Rockford, Ill.	**45,401**	**Tacoma, Wash.**	**83,743**	**Youngstown, Ohio.**	**79,066**
Sacramento, Cal.	**44,696**	**Tampa, Fla.**	**37,782**	**Zanesville, Ohio.**	**28,026**
Saginaw, Mich.	**50,510**	**Taunton, Mass.**	**34,259**		



POPULATION OF URBAN AND RURAL TERRITORY.

CLASS OF PLACES.	1910		1900		1890		PER CENT OF TOTAL POPULATION.		
	Number of places.	Population.	Number of places.	Population.	Number of places.	Population.	1910	1900	1890
Total population of continental United States	....	91,972,266	....	75,994,575	....	62,947,714	100.0	100.0	100.0
Urban territory	**2,405**	**42,623,383**	**1,894**	**30,797,185**	**1,510**	**22,720,223**	**46.3**	**40.5**	**36.1**
Places of 1,000,000 inhabitants or more	3	8,501,174	3	6,429,474	3	3,662,115	9.2	8.5	5.8
Places of 500,000 to 1,000,000 inhabitants	5	3,010,667	3	1,645,087	1	806,343	3.3	2.2	1.3
Places of 250,000 to 500,000 inhabitants	11	3,949,839	9	2,861,296	7	2,447,608	4.3	3.8	3.9
Places of 100,000 to 250,000 inhabitants	31	4,840,458	23	3,272,490	17	2,781,894	5.3	4.3	4.4
Places of 50,000 to 100,000 inhabitants	59	4,178,915	41	2,760,477	30	2,027,569	4.5	3.6	3.2
Places of 25,000 to 50,000 inhabitants	120	4,062,763	82	2,785,667	67	2,298,765	4.4	3.7	3.7
Places of 10,000 to 25,000 inhabitants	374	5,609,208	286	4,409,900	232	3,487,139	6.1	5.8	5.5
Places of 5,000 to 10,000 inhabitants	629	4,364,703	477	3,278,518	361	2,495,594	4.7	4.3	4.0
Places of 2,500 to 5,000 inhabitants	1,173	4,105,656	970	3,354,276	792	2,713,196	4.5	4.4	4.3
Rural territory	....	**49,348,883**	....	**45,197,390**	....	**40,227,491**	**53.7**	**59.5**	**63.9**
Incorporated places of less than 2,500 inhabitants	11,784	8,119,528	8,892	6,247,645	6,466	4,719,835	8.8	8.2	7.5
Other rural territory	....	41,229,355	....	38,949,745	....	35,507,656	44.8	51.3	56.4

VOTING AMERICANS.

In 1910 the number of males of voting age in continental United States was 26,999,151, or 29.4 per cent. of the total population, as compared with 21,134,299, or 27.8 per cent. of the total population in 1900. Of these 13,211,731 were of native-born white parentage; 4,498,966 native white of foreign or mixed parentage; 3,035,333 of naturalized, foreign-born white population; 570,588, foreign-born white, of parents who had taken out their first papers; 2,265,121 of alien, foreign-born white population; 775,564 of other foreign-born white parentage; 2,459,327 of negro parentage; and 182,521 of all other parentage, inclusive of Indians, Chinese, Japanese, and other Asiatics. In 1910 there were 2,998,073 women of voting age in the nine states (see below) in which woman suffrage prevails.

WOMAN SUFFRAGE IN THE UNITED STATES.

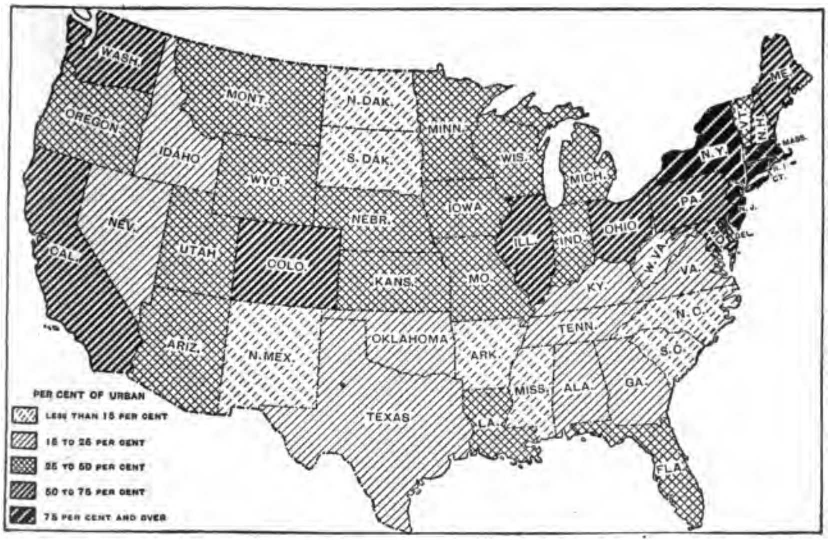
In the United States women enjoy suffrage on equal terms with men at all elections in nine states, as follows: Wyoming, established in 1869; Colorado, in 1893; Utah, in 1896; Idaho, in 1896; Washington, in 1910 and California, in 1911, Kansas, in 1912; and Oregon, in 1912. Besides the school suffrage, which prevails in some form in 31 states, taxpaying women have been granted the right to vote as follows: In Montana, Louisiana and Michigan, on questions submitted to taxpayers, with a proxy vote permitted in Louisiana; in Iowa and Kansas, on the question of issuing bonds; in Minnesota, equal suffrage on the election of library trustees; in Kansas, municipal suffrage; in New York, on local taxation; limited suffrage exists in Illinois

CHRISTIAN ASSOCIATIONS.

The Young Men's Christian Association was organized in England in 1821 by Sir George Williams; the movement has spread to America, Germany, Denmark, Norway, Switzerland, and even China and Japan. In 1912 there were 2,192 associations in North America, with a membership of 566,101; total net property, $73,160,293; number of employed officers, 3,633; students in educational classes, 67,417; 613 gymnasiums; 175,433 enrolled in gymnasiums; 167 athletic fields; 232 railroad associations with 83,466 members; 724 student associations with 62,938 members; boy membership, 112,871. There were also in 1912, 208 city associations for women, 660 student and 7 county associations with a total membership of 253,406 young women.

PERCENTAGE OF INCREASE IN URBAN POPULATION:
1900–1910.

PERCENTAGE OF INCREASE IN RURAL POPULATION:
1900–1910.



PERCENTAGE OF URBAN IN TOTAL POPULATION IN 1910.

COLOR, NATIVITY AND PARENTAGE OF POPULATION, FOR PRINCIPAL CITIES OF THE UNITED STATES.

There are in all 229 cities which had in 1910 more than 25,000 inhabitants, with an aggregate population of 28,543,816. Of the combined population of these cities, native whites of native parentage number 10,149,145, or 35.6 per cent.; native whites of foreign or mixed parentage, 9,218,999, or 32.3 per cent.; foreign-born whites, 7,478,990, or 26.2 per cent.; negroes, 1,625,601, or 5.7 per cent.; all other, 71,081, or 0.2 per cent. For continental United States, as a whole, the equivalent numbers and percentages are: Native whites of native parentage, 49,488,575, or 53.8 per cent; native whites of foreign or mixed parentage 18,897,837, or 20.5 per cent.; foreign-born whites, 13,345,545, or 14.5 per cent.; negroes, 9,827,763, or 10.7 per cent.

The combined population (28,543,816) of the 229 cities taken together constitutes 31 per cent. of the entire population (91,972,266) of continental United States in 1910. In the case, however, of native whites of native parentage, the number in these cities constitutes only 20.5 per cent. of the total number in the United States, while for native whites of foreign or mixed parentage the percentage is 48.8 and for foreign-born whites, 56. For negroes the percentage in the principal cities is 16.5.

The foreign-born white element is mainly concentrated in the Northern and Eastern states, and in many of the cities in these states the proportion of foreign-born whites in the total population is very large. Passaic, N. J., has 28,467 foreign-born whites, representing 52 per cent. of its total population (54,773). This is the largest proportion of foreign-born whites in any of the principal cities, and Lawrence, Mass., with 41,319 foreign-born whites in a total population of 85,892, has the next largest proportion, 48.1 per cent. There are 11 other cities in each of which the foreign-born whites constitute more than 40 per cent. of the total population, namely, Perth Amboy, N. J., 44.5; New Bedford, Mass., 44.1; Woonsocket, R. I., 43.4; Fall River, Mass., 42.6; Chelsea, Mass., 42.4; Manchester, N. H., 42.4; New Britain, Conn., 41; Lowell, Mass., 40.9; Shenandoah, Pa., 40.6; New York, N. Y., 40.4; Holyoke, Mass., 40.3.

Negroes constitute one-fourth or more of the total population in each of 27 principal cities, and in 4 of them the proportion is more than half, namely, Charleston, S. C., 31,056 negroes, or 52.8 per cent.; Savannah, Ga., 33,246, or 51.1 per cent.; Jacksonville, Fla., 29,293 or 50.8 per cent.; Montgomery, Ala., 19,322, or 50.7 per cent.

AREA OF STATES AND TERRITORIES.

[Based upon careful joint calculations made in the General Land Office, the Geological Survey, and the Bureau of the Census.]

States or Territories.	Land surface.		Water surface.		Total areas.	
	Sq. m.	*Acres.*	*Sq. m.*	*Acres.*	*Sq. m.*	*Acres.*
Alabama	51,279	32,818,560	719	460,160	51,998	33,278,720
Arizona	113,810	72,838,400	146	93,440	113,956	72,931,840
Arkansas	52,525	33,616,000	810	518,400	53,335	34,134,400
California	155,652	99,617,280	2,645	1,692,800	158,297	101,310,080
Colorado	103,658	66,341,120	290	185,600	103,948	66,526,720
Connecticut	4,820	3,084,800	145	92,800	4,965	3,177,600
Delaware	1,965	1,257,600	405	259,200	2,370	1,516,800
District of Columbia	60	38,400	10	6,400	70	44,800
Florida	54,861	35,111,040	3,805	2,435,200	58,666	37,546,240
Georgia	58,725	37,584,000	540	345,600	59,265	37,929,600
Idaho	83,354	53,346,560	534	341,760	83,888	53,688,320
Illinois	56,043	35,867,520	622	398,080	56,665	36,265,600
Indiana	35,815	23,068,800	309	197,760	36,354	23,266,560
Iowa	55,586	35,575,040	561	359,040	56,147	35,934,080
Kansas	81,774	52,335,360	384	245,760	82,158	52,581,120
Kentucky	40,181	25,715,840	417	266,880	40,598	25,982,720
Louisiana	45,409	29,061,760	3,097	1,982,080	48,506	31,043,840
Maine	29,895	19,132,800	3,145	2,012,800	33,040	21,145,600
Maryland	9,941	6,362,240	2,386	1,527,040	12,327	7,889,280
Massachusetts	8,039	5,144,960	227	145,280	8,266	5,290,240
Michigan	57,480	36,787,200	500	320,000	57,980	37,107,200
Minnesota	80,858	51,749,120	3,824	2,447,360	84,682	54,196,480
Mississippi	46,362	29,671,680	503	321,920	46,865	29,993,600
Missouri	68,727	43,985,280	693	443,520	69,420	44,428,800
Montana	146,201	93,568,640	796	509,440	146,997	94,078,080
Nebraska	76,808	49,157,120	712	455,680	77,520	49,612,800
Nevada	109,821	70,285,440	869	556,160	110,690	70,841,600
New Hampshire	9,031	5,779,840	310	198,400	9,341	5,978,240
New Jersey	7,514	4,808,960	710	454,400	8,224	5,263,360
New Mexico	122,503	78,401,920	131	83,840	122,634	78,485,760
New York	47,654	30,498,560	1,550	992,000	49,204	31,490,560
North Carolina	48,740	31,193,600	3,686	2,359,040	52,426	33,552,640
North Dakota	70,183	44,917,120	654	418,560	70,837	45,335,680
Ohio	40,740	26,073,600	300	192,000	41,040	26,265,600
Oklahoma	69,414	44,424,960	643	411,520	70,057	44,836,480
Oregon	95,607	61,188,480	1,092	698,880	96,699	61,887,360
Pennsylvania	44,832	28,692,480	294	188,160	45,126	28,880,640
Rhode Island	1,067	682,880	181	115,840	1,248	798,720
South Carolina	30,495	19,516,800	494	316,160	30,989	19,832,960
South Dakota	76,868	49,195,520	747	478,080	77,615	49,673,600
Tennessee	41,687	26,679,680	335	214,400	42,022	26,894,080
Texas	262,398	167,934,720	3,498	2,238,720	265,896	170,173,440
Utah	82,184	52,597,760	2,806	1,795,840	84,990	54,393,600
Vermont	9,124	5,839,360	440	281,600	9,564	6,120,960
Virginia	40,262	25,767,680	2,365	1,513,600	42,627	27,281,280
Washington	66,836	42,775,040	2,291	1,466,240	69,127	44,241,280
West Virginia	24,022	15,374,080	148	94,720	24,170	15,468,800
Wisconsin	55,256	35,363,840	810	518,400	56,066	35,882,240
Wyoming	97,594	62,460,160	320	204,800	97,914	62,664,960
	2,973,890	1,903,289,600	52,899	33,855,360	3,026,789	1,937,144,960
Alaska					590,884	378,165,760
Guam					210	134,400
Hawaii					6,449	4,127,360
Panama Canal strip					474	303,360
Philippine Islands					115,026	73,616,640
Porto Rico					3,435	2,198,400
Tutuila Group, Samoa					77	49,280
Total					3,743,344	2,395,740,160

Owing to their location adjoining the Great Lakes, the States enumerated below contain approximately an additional number of square miles as follows: Illinois, 1,674 square miles of Lake Michigan; Indiana, 230 square miles of Lake Michigan; Michigan, 16,653 square miles of Lake Superior, 12,922 square miles of Lake Michigan, 9,925 square miles of Lake Huron, and 460 square miles of lakes St. Clair and Erie; Minnesota, 2,514 square miles of Lake Superior, New York, 3,140 square miles of lakes Ontario and Erie; Ohio, 3,443 square miles of Lake Erie; Pennsylvania, 891 square miles of Lake Erie; Wisconsin, 2,378 square miles of Lake Superior and 7,500 square miles of Lake Michigan.

In addition to the water areas noted above, California claims jurisdiction over all Pacific waters lying within 3 English miles of her coast; Oregon claims jurisdiction over a similar strip of the Pacific Ocean 1 marine league in width between latitude 42° north and the mouth of the Columbia River; and Texas claims jurisdiction over a strip of Gulf water 3 leagues in width, adjacent to her coast and between the Rio Grande and the Sabine River.

AREA OF THE UNITED STATES BY SIZE OF STATES.

STATE.	Rank in gross area.	AREA IN SQUARE MILES. Gross.	Land.	Water.[1]
Continental United States	......	**3,026,789**	**2,973,890**	**52,899**
Texas	1	265,896	262,398	3,498
California	2	158,297	155,652	2,645
Montana	3	146,997	146,201	796
New Mexico	4	122,634	122,503	131
Arizona	5	113,956	113,810	146
Nevada	6	110,690	109,821	869
Colorado	7	103,948	103,658	290
Wyoming	8	97,914	97,594	320
Oregon	9	96,699	95,607	1,092
Utah	10	84,990	82,184	2,806
Minnesota	11	84,682	80,858	3,824
Idaho	12	83,888	83,354	534
Kansas	13	82,158	81,774	384
South Dakota	14	77,615	76,868	747
Nebraska	15	77,520	76,808	712
North Dakota	16	70,837	70,183	654
Oklahoma	17	70,057	69,414	643
Missouri	18	69,420	68,727	693
Washington	19	69,127	66,836	2,291
Georgia	20	59,265	58,725	540
Florida	21	58,666	54,861	3,805
Michigan	22	57,980	57,480	500
Illinois	23	56,665	56,043	622
Iowa	24	56,147	55,586	561
Wisconsin	25	56,066	55,256	810
Arkansas	26	53,335	52,525	810
North Carolina	27	52,426	48,740	3,686
Alabama	28	51,998	51,279	719
New York	29	49,204	47,654	1,550
Louisiana	30	48,506	45,409	3,097
Mississippi	31	46,865	46,362	503
Pennsylvania	32	45,126	44,832	294
Virginia	33	42,627	40,262	2,365
Tennessee	34	42,022	41,687	335
Ohio	35	41,040	40,740	300
Kentucky	36	40,598	40,181	417
Indiana	37	36,354	36,045	309
Maine	38	33,040	29,895	3,145
South Carolina	39	30,989	30,495	494
West Virginia	40	24,170	24,022	148
Maryland	41	12,327	9,941	2,386
Vermont	42	9,564	9,124	440
New Hampshire	43	9,341	9,031	310
Massachusetts	44	8,266	8,039	227
New Jersey	45	8,224	7,514	710
Connecticut	46	4,965	4,820	145
Delaware	47	2,370	1,965	405
Rhode Island	48	1,248	1,067	181
District of Columbia	49	70	60	10

[1] Does not include the water surface of the oceans, the Gulf of Mexico, or the Great Lakes, lying within the jurisdiction of the United States.

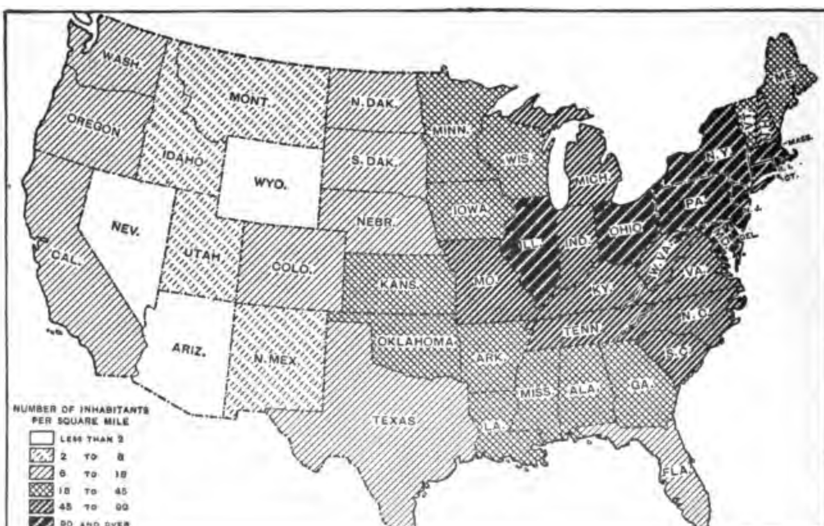
A census just completed by the Isthmian Canal Commission shows that in 1911 there were 154,255 persons in the Canal Zone. The City of Panama has a population of 35,368, of which 18,237 are Mestizos, 10,963 negroes, 7,008 white, and 1,180 Amarillos or yellows. Colon has 17,748 inhabitants.

POPULATION OF CONTINENTAL UNITED STATES PER SQUARE MILE.

CENSUS YEAR.	Population of continental United States.	Land area in square miles.	Population per square mile.
1910	91,972,266	2,973,890	30.9
1900	75,994,575	2,974,159	25.6
1890	62,947,714	2,973,965	21.2
1880	50,155,783	2,973,965	16.9
1870	38,558,371	2,973,965	13.0
1860	31,443,321	2,973,965	10.6
1850	23,191,876	2,944,337	7.9
1840	17,069,453	1,753,588	9.7
1830	12,866,020	1,753,588	7.3
1820	9,638,453	1,753,588	5.5
1810	7,239,881	1,685,865	4.3
1800	5,308,483	867,980	6.1
1790	3,929,214	867,980	4.5

PRISON POPULATION IN 1910.

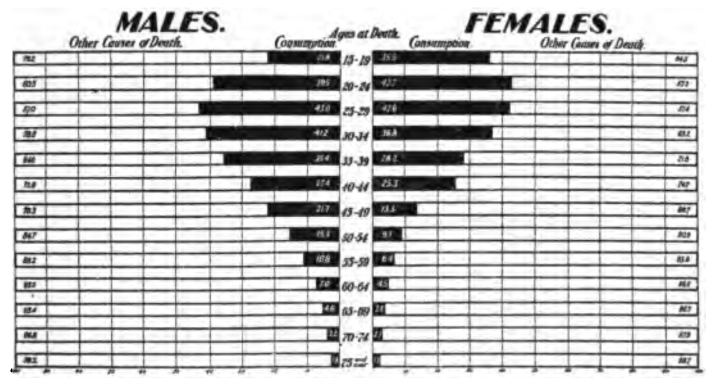
The prison population of the United States on January 1, 1910 was 111,609, and the number of commitments to prisons or other penal institutions, during the year 1910, was 479,890. These figures include every class of offense, from vagrancy to murder in the first degree. They also include cases in which the offender was committed to jail or prison for the non-payment of a fine. The ratio of prisoners to population on January 1, 1910, was 121 to 100,000, and the ratio of commitments to population during the year 1910 was 522 to 100,000. Thus it appears that, at the beginning of the year 1910, one person out of every 826 in the United States greeted the New Year in jail; and that, during 1910, for every 192 persons in the total population, there was one commitment to prison or jail, for a period ranging from one day to a life sentence.



POPULATION PER SQUARE MILE: 1910.

Mortality from Consumption by Age and Sex.

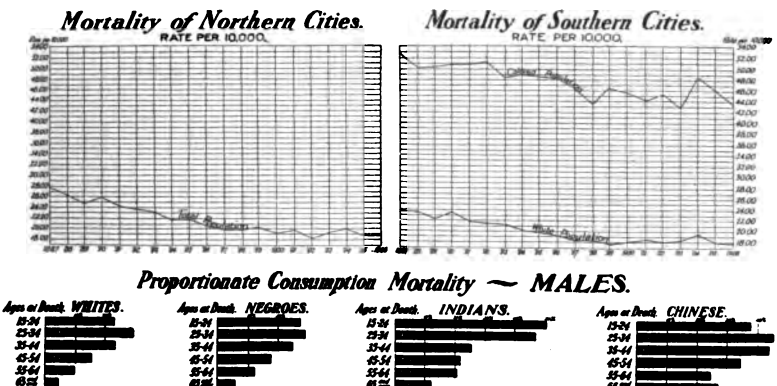
Prudential Industrial Experience ~ 1897–1906.



Note: The proportionate mortality of males and females from consumption is shown to vary according to age, reaching a maximum at 25-29 when out of every 100 deaths from all causes among males 43.0 are from consumption and among females 42.6. At ages 15-24 the proportionate mortality from consumption is higher among females and at ages 25 and over it is higher among males

Mortality from Consumption ~ *General Population.*

1887–1906.



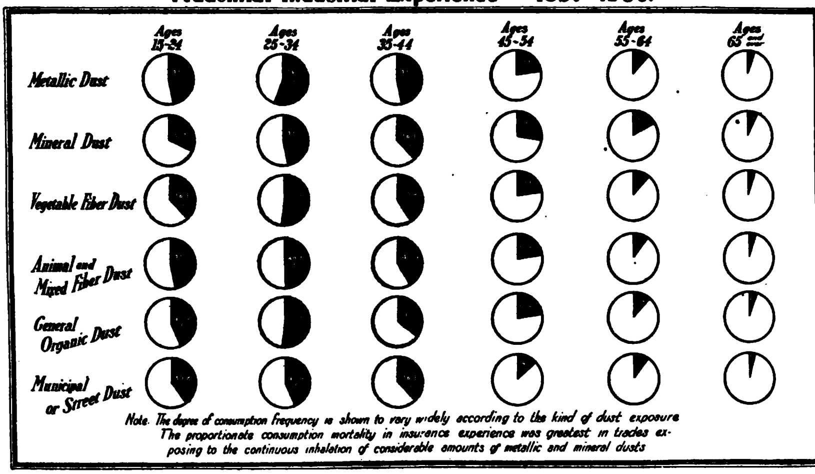
Note: The proportionate consumption mortality is determined by calculating the percentage of deaths from consumption in the mortality from all causes at specified periods of life. For illustration: at ages 15-24 out of every 100 deaths from all causes, among white males 21.7 are from consumption; among negro males 27.8, among male Indians 50.0, and among male Chinese (in the U.S.) 37.2

INDIANS.

Only eleven of the states in the United States have large Indian populations, namely: Oklahoma with 117,444; Arizona with 40,754; New Mexico with 21,374; South Dakota with 20,333; California with 17,517; Minnesota with 11,116; Wisconsin with 9,816; North Dakota with 8,380; and Michigan with 7,519. The other states of the Union have a total Indian population of 53,121 and rank according to the number of Indian inhabitants as follows: Oregon, New York, Nevada, Nebraska, Wyoming, Kansas, Utah and other states. The total Indian population of the United States is (1912) 319,216.

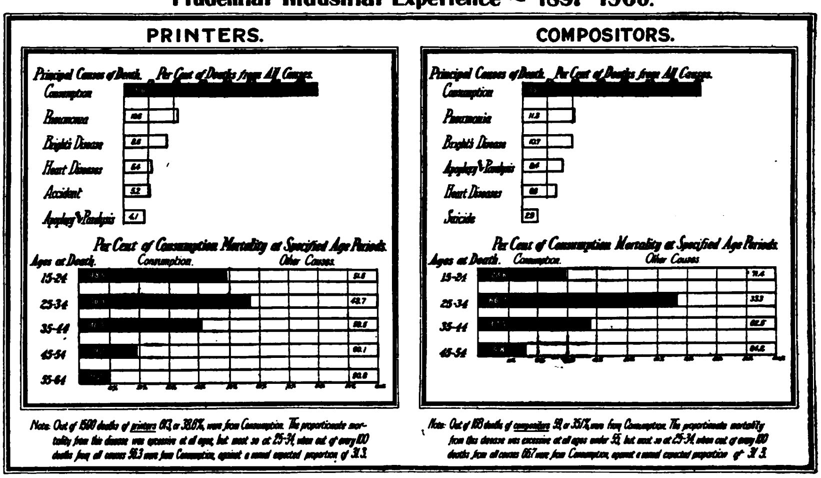
Mortality from Consumption in Dusty Trades.

Prudential Industrial Experience ~ 1897~1906.



Mortality from Consumption-*Exposure to Metallic Dust.*

Prudential Industrial Experience ~ 1897~1906.



Recent statistics show that at the end of May, 1910, there were 431 state and local anti-tuberculosis associations, 286 special dispensaries, 393 special sanatoria and hospitals, and 22,720 beds for tuberculosis cases. It was estimated that there were 300,000 indigent consumptives in the United States, in May, 1910, and that it would cost $50,000,000 yearly to take care of them in institutions.

SUICIDES IN ONE HUNDRED AMERICAN CITIES, 1891-1912.

Years.	Population.	Suicides.	Rate per 100,000 Population.
1891	12,818,957	1,727	13.5
1892	13,335,186	1,713	12.8
1893	13,686,566	2,097	15.3
1894	14,038,525	2,139	15.2
1895	14,539,050	2,218	15.3
1896	15,027,676	2,360	15.7
1897	15,416,634	2,583	16.8
1898	15,892,764	2,630	16.5
1899	16,269,285	2,594	15.9
1900	16,753,366	2,728	16.3
1901	17,248,177	2,855	16.6
1902	17,743,001	3,139	17.7
1903	18,237,846	3,513	19.3
1904	18,732,699	3,766	20.1
1905	19,254,249	3,650	19.0
1906	19,837,798	3,537	17.8
1907	20,421,363	3,975	19.5
1908	21,004,936	4,582	21.8
1909	21,588,516	4,537	21.0
1910	22,172,095	4,377	19.7
1891-1895	68,418,284	9,894	14.5
1896-1900	79,359,725	12,895	16.2
1901-1905	.91,215,972	16,923	18.6
1906-1910	105,024,708	21,008	20.0

Courtesy of The Spectator.—F. L. Hoffman, Compiler.

During the year 1911 there were 4,460 suicides out of a population of 22,758,471, or equivalent to 19.6 per 100,000 of population. During 1912 there were 4,397 suicides out of a population of 23,336,602 or 18.8 per 100,000 population.

COMPARISON OF SUICIDES AND BUSINESS FAILURES IN THE UNITED STATES, 1891-1912.

Year.	Suicides per 100,000 of Population in 100 American Cities.	Business Failures in the United States per 1,000 Existing Business Concerns.*
1891	13.5	10.7
1892	12.8	8.8
1893	15.3	12.8
1894	15.2	12.5
1895	15.3	10.9
1896	15.7	13.1
1897	16.8	12.6
1898	16.5	11.0
1899	15.9	8.1
1900	16.3	9.2
1901	16.6	9.0
1902	17.7	9.3
1903	19.3	9.4
1904	20.1	9.2
1905	19.0	8.5
1906	17.8	7.7
1907	19.5	8.2
1908	21 8	10.8
1909	21.0	8.0
1910	19.7	8.0

* Furnished by R. G. Dun & Co.

In 1911 there were 8.1 and in 1912, 9.8 failures per 1,000 existing business concerns.

DEATHS IN REGISTRATION AREA.

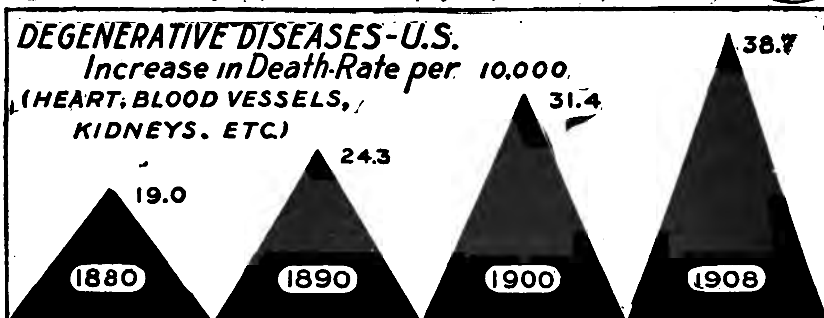
During the year 1911 the total number of deaths in the Registration Area of the United States was 839,284; this comprises only 58.3 per cent. of the population of the country, so that if the same proportion of deaths were found in the districts where there is no registration, the total number of deaths in the United States would be nearly double the figure given above. Of this number, 779,770, or 929.1 for every thousand deaths, were white. Of the deaths among the whites, 569,425 were native born, of which number 306,192 had both parents native born and 193,628 had parents either one or both of which were foreign born. Other deaths among the white population were 199,346 foreign born, and 10,999 unknown. The deaths among the colored population totaling 59,519, or 70.9 for every thousand deaths, were divided as follows: Negro, 56,431; Indian, 1,539; and Chinese and Japanese, 1,724.

Of the total number of deaths, 457,308 were males and 381,976 were females. The total number of deaths among children less than one year of age was 149,322; of those from one to five years of age, 60,160; from five to twenty-five, 83,909; from twenty-five to fifty, 184,214; from fifty to seventy-five, 247,008; over seventy-five, 113,375; and of unknown age, 1,296.

Out of every thousand deaths, 177.9 occur before the end of the first year of life; 71.7 between the ages of one and five; 100.0 between five and twenty-five; 219.5 between twenty-five and fifty; 324.4 between fifty and seventy-five; 135.0 above seventy-five; and 1.5 at an unknown age. Out of every one thousand deaths 544.9 are males and 455.1 females.

Dividing the deaths in the Registration Area of the United States for the year 1911 according to diseases, we find that 12,451 died of typhoid fever; 1,802 of malaria; smallpox, 130; measles, 5,922; scarlet fever, 5,243; whooping cough, 6,682; diphtheria and croup, 11,174; influenza, 9,244; other epidemic diseases, 6,133; tuberculosis, 94,205; cancer and other malignant tumors, 44,024; diabetes, 8,805; diseases of the nervous system and of the organs of special sense, 81,428; diseases of the circulatory system, 109,830; diseases of the respiratory system, 99,650; diseases of the digestive system, 98,600; non-venereal diseases of the genito-urinary system and annexa, 67,348; from external causes, suicide, 9,622; accidental or undefined, 50,121; homicide, 3,907; and all other causes, 112,913.

The rate of death per hundred thousand population of the more important of these diseases is as follows: Typhoid fever, 21.0; tuberculosis, 158.8; cancer and other malignant tumors, 74.3; diseases of the nervous system and of the organs of special sense, 137.4; diseases of the circulatory system, 185.3; diseases of the respiratory system, 168.1; diseases of the digestive system, 166.3; non-venereal diseases of the genito-urinary system, and annexa, 113.6.



THE PENALTY OF NEGLECT

The heavy increase in life waste from diseases of the heart, blood vessels, kidneys—apoplexy, etc., demands the attention of the American people. They are over-taxing and neglecting the hardest worked organs of the body, and the penalty is needless disease and premature death for tens of thousands annually. This can only be checked by the adoption of more healthful habits of living and by improvement in hygiene and sanitation.

SUICIDE RECORD OF 1912.

The suicide record of 100 American cities for the year ending 1912 shows a suicide mortality of 4,397 out of a total population for these cities of 23,336,602, or equivalent to 20.2 per 100,000 of population. With only two exceptions this is the lowest rate attained during any year since 1901, when the rate was only 16.6. The average suicide rate by quinquennial periods for the last two decades eliminating fluctuations by single years, has shown a continuous upward tendency, being 15.7 for the first five years, 16.6 during the next five years, and increasing to 19.1 and 20.2 in the succeeding periods. The highest recorded rate for the 100 cities was for San Francisco, Cal., in which the rate was 44.0 per 100,000 of population, against the general average for all the cities of 20.2.

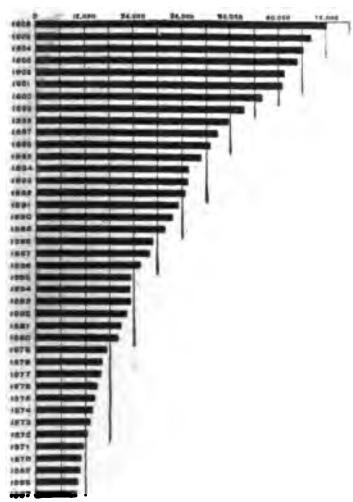
Abstract from article by F. L. Hoffman in "The Spectator," October 2, 1913.

MARRIAGES AND DIVORCES: NUMBER AND INCREASE, SPECIFYING DIVORCES GRANTED TO HUSBAND OR WIFE, 1887 TO 1906.

[Source: Reports of the Bureau of the Census, Department of Commerce and Labor.]

Calendar year.	Marriages.		Divorces.					
	Number.	Increase over preceding year.	Total number.	Increase over preceding year.	Granted to husband.		Granted to wife.	
					Number.	Per cent.	Number.	Per cent.
1887	483,069	....	27,919	2,384	9,729	34.8	18,190	65.2
1888	504,530	21,461	28,669	750	10,022	35.0	18,647	65.0
1889	531,457	26,927	31,735	3,066	11,126	35.1	20,609	64.9
1890	542,537	11,080	33,461	1,726	11,625	34.7	21,836	65.3
1891	562,412	19,875	35,540	2,079	12,478	35.1	23,062	64.9
1892	577,870	15,458	36,579	1,039	12,577	34.4	24,002	65.6
1893	578,673	803	37,468	889	12,590	33.6	24,878	66.4
1894	566,161	[1] 12,512	37,568	100	12,551	33.4	25,017	66.6
1895	598,855	32,694	40,387	2,819	13,456	33.3	26,931	66.7
1896	613,873	15,018	42,937	2,550	14,448	33.6	28,489	66.4
1897	622,350	8,477	44,699	1,762	14,765	33.0	29,934	67.0
1898	625,655	3,305	47,849	3,150	15,988	33.4	31,861	66.6
1899	650,610	24,955	51,437	3,588	16,925	32.9	34,512	67.1
1900	685,284	34,674	55,751	4,314	18,620	33.4	37,131	66.6
1901	716,621	31,337	60,984	5,233	20,008	32.8	40,976	67.2
1902	746,733	30,112	61,480	496	20,056	32.6	41,424	67.4
1903	786,132	39,399	64,925	3,445	21,321	32.8	43,604	67.2
1904	781,145	[1] 4,987	66,199	1,274	22,189	33.5	44,010	66.5
1905	804,787	23,642	67,976	1,777	22,220	32.7	45,756	67.3
1906	853,290	48,503	72,062	4,086	23,455	32.5	48,607	67.5

[1] Decrease.



ANNUAL NUMBER OF DIVORCES
1867-1906.

During the hunting season of 1911 there were 101 deaths recorded as against 113 for 1910, 87 in 1909, 57 in 1908, 82 in 1907 and 74 in 1906. The greatest number of deaths occurred in the State of Michigan where 16 persons were killed, followed by Illinois with 14 and Wisconsin with 13.

FOREIGN-BORN WHITE POPULATION OF THE U. S. BY COUNTRY OF BIRTH.

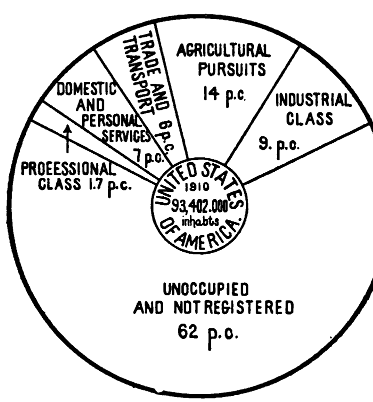
COUNTRY.	1910	1900	Increase.
Total foreign-born white....	13,342,500	10,213,817	3,128,683
Austria-Hungary...	1,658,700	636,968	1,021,732
Austria...........	1,190,200	491,259	698,941
Hungary..........	468,500	145,709	322,791
Germany...........	2,499,200	2,813,413	−314,213
Great Britain.......	1,221,400	1,166,863	54,537
England..........	875,400	839,830	35,570
Scotland..........	263,400	233,473	29,927
Wales............	82,600	93,560	−10,960
Ireland.............	1,351,400	1,615,232	−263,832
Italy...............	1,341,800	483,963	857,837
Russia and Finland.	1,706,900	640,710	1,066,190
Russia...........	1,577,300	578,072	999,228
Finland..........	129,600	62,638	66,962
Norway, Sweden, and Denmark...	1,250,500	1,062,124	188,376
Norway..........	403,500	336,379	67,121
Sweden..........	665,500	571,986	93,514
Denmark.........	181,500	153,759	27,741
Other Europe.......	749,300	450,036	299,264
France...........	117,100	104,031	13,069
Greece...........	101,100	8,513	92,587
Holland..........	120,000	104,922	15,078
Switzerland.......	124,800	115,581	9,219
All other.........	286,300	116,989	169,311
Canada and Newfoundland........	1,198,000	1,172,745	25,255
Mexico.............	218,800	101,908	116,892
All other countries..	146,500	69,855	76,645

DIVORCES: Number and Causes, Specifying those Granted to Husband or Wife, by Quinquennial Periods, 1887 to 1906.

[Source: Reports of the Bureau of the Census, Department of Commerce and Labor.]

Cause.	1887-1891		1892-1896		1897-1901		1902-1906		Increase 1902-1906 as compared with 1887-1891	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
GRANTED TO HUSBAND.										
Adultery	17,139	31.2	19,956	30.4	24,269	28.1	29,526	27.0	12,387	72.3
Cruelty	4,047	7.4	6,068	9.2	9,385	10.9	13,678	12.5	9,631	238.0
Desertion	27,150	49.4	31,805	48.5	43,186	50.0	54,142	49.6	26,992	99.4
Drunkenness	592	1.1	765	1.2	986	1.1	1,093	1.0	501	84.6
Neglect to provide	......	......	2	(1)	1	(1)	3	(1)	3	(1)
Combinations of preceding causes, etc	2,654	4.8	3,190	4.9	3,681	4.3	4,805	4.4	2,151	81.0
All other causes [2]	3,398	6.2	3,836	5.8	4,798	5.6	5,994	5.5	2,596	76.4
Total	54,980	100.0	65,622	100.0	86,306	100.0	109,241	100.0	54,261	98.7
GRANTED TO WIFE.										
Adultery	10,880	10.6	13,714	10.6	16,915	9.7	21,360	9.6	10,480	96.3
Cruelty	25,200	24.6	34,509	26.7	48,797	28.0	64,541	28.9	39,341	156.1
Desertion	35,666	34.8	43,153	33.4	58,382	33.5	74,018	33.1	38,352	107.5
Drunkenness	5,397	5.3	6,913	5.3	8,828	5.1	11,942	5.3	6,545	121.3
Neglect to provide	4,605	4.5	6,857	5.3	10,423	6.0	12,779	5.7	8,174	177.5
Combinations of preceding causes, etc	13,770	13.5	15,757	12.2	19,979	11.5	25,013	11.2	11,243	81.6
All other causes [2]	6,826	6.7	8,414	6.5	11,090	6.4	13,748	6.2	6,922	101.4
Total	102,344	100.0	129,317	100.0	174,414	100.0	223,401	100.0	121,057	118.3

[1] Less than one-tenth of 1 per cent. [2] Includes causes unknown.



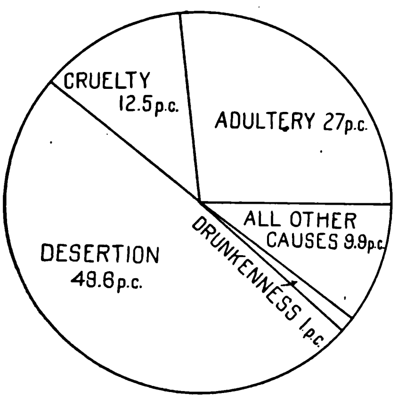
APPROXIMATE DISTRIBUTION OF PURSUITS.

DIVORCES: TOTAL NUMBER GRANTED, SPECIFYING THOSE GRANTED TO HUSBAND OR WIFE, BY NUMBER OF YEARS MARRIED, 1887 TO 1906.[1]

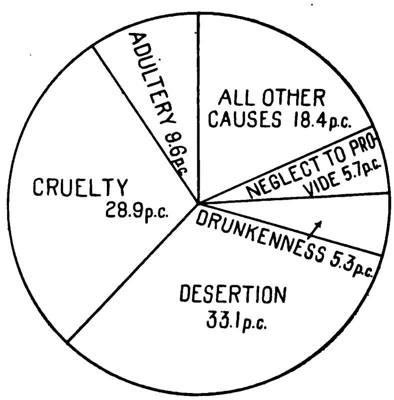
[Source: Reports of the Bureau of the Census, Department of Commerce and Labor.]

Number of years married.	Granted to husband.		Granted to wife.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Less than 1 year	6,684	2.2	12,192	2.0	18,876	2.1
1 year	9,074	3.1	18,689	3.1	27,763	3.1
2 years	19,571	6.6	41,910	6.9	61,481	6.8
3 years	24,033	8.1	49,019	8.1	73,052	8.1
4 years	24,438	8.2	49,475	8.2	73,913	8.2
5 years	22,942	7.7	45,828	7.6	68,770	7.6
6 years	31,142	7.1	41,524	6.9	62,666	7.0
7 years	18,947	6.4	37,470	6.2	56,417	6.3
8 years	17,059	5.7	33,595	5.6	50,654	5.6
9 years	14,659	4.9	29,738	4.9	44,397	4.9
10 years	13,631	4.6	27,099	4.5	40,730	4.5
11 years	12,081	4.1	24,288	4.0	36,369	4.0
12 years	10,521	3.5	21,450	3.6	31,971	3.6
13 years	9,230	3.1	19,030	3.2	28,260	3.1
14 years	8,210	2.8	16,867	2.8	25,077	2.8
15 years	7,376	2.5	15,603	2.6	22,979	2.6
16 years	6,393	2.1	13,632	2.3	20,025	2.2
17 years	5,742	1.9	12,159	2.0	17,901	2.0
18 years	5,125	1.7	10,893	1.8	16,018	1.8
19 years	4,446	1.5	9,807	1.6	14,253	1.6
20 years	4,351	1.5	9,513	1.6	13,864	1.5
21 years	3,805	1.3	8,336	1.4	12,141	1.3
22 years	3,318	1.1	7,171	1.2	10,489	1.2
23 years	2,913	1.0	6,575	1.1	9,488	1.1
24 years	2,644	.9	5,952	1.0	8,596	1.0
25 years and over	19,120	6.4	35,314	5.9	54,434	6.0
Total	297,455	100.0	603,129	100.0	900,584	100.0

[1] Calendar years.

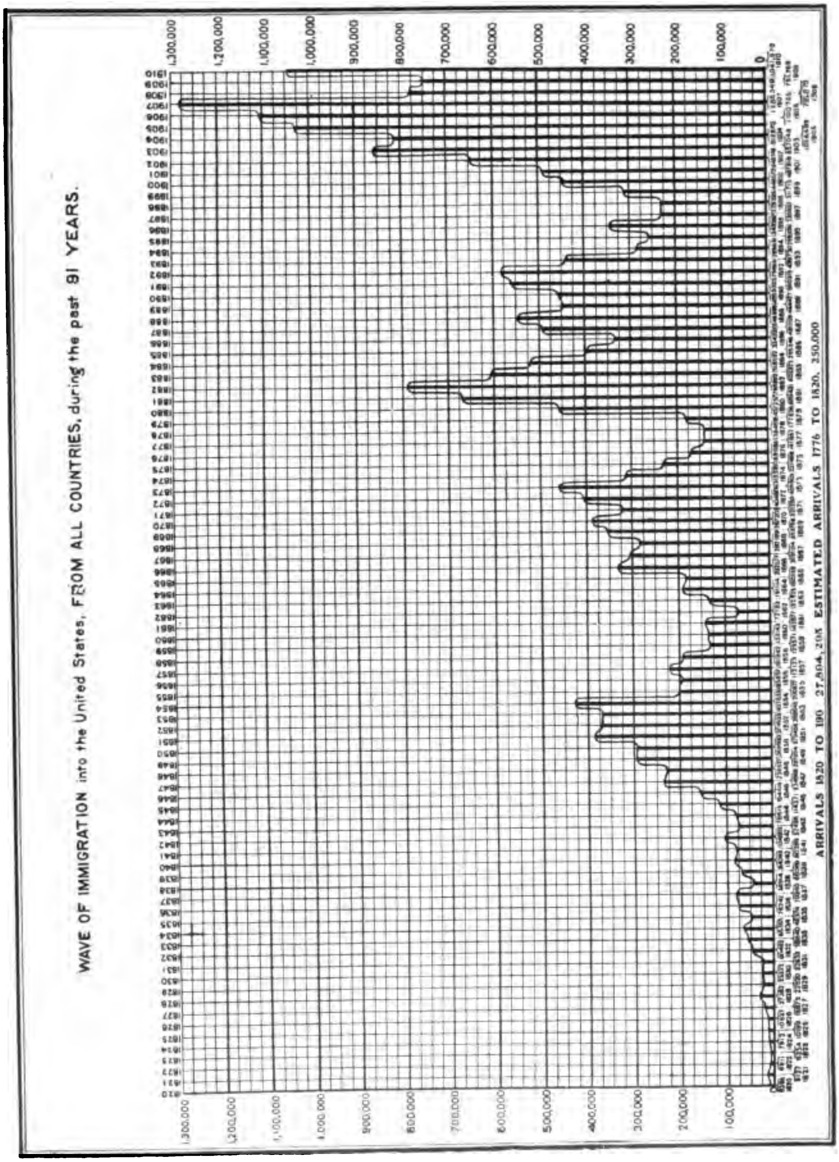


GRANTED TO HUSBAND.



GRANTED TO WIFE.

CAUSES FOR DIVORCES 1902-1906.


WAVE OF IMMIGRATION into the United States, FROM ALL COUNTRIES, during the past 91 YEARS.
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
ARRIVALS 1820 TO 190 27,804,208 ESTIMATED ARRIVALS 1776 TO 1820, 250,000

IMMIGRANT ALIENS ADMITTED, YEARS ENDED JUNE 30, 1903 TO 1912: BY RACE OR PEOPLE.

[Source: Reports of the Commissioner General of Immigration, Department of Commerce and Labor.]

Race or people.	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
African (black)	2,174	2,386	3,598	3,786	5,235	4,626	4,307	4,966	6,721	6,759
Armenian	1,759	1,745	1,878	1,895	2,644	3,299	3,108	5,508	3,092	5,222
Bohemian, Moravian	9,591	11,911	11,757	12,958	13,554	10,164	6,850	8,462	9,223	8,439
Bulgarian, Servian, Montenegrin	6,479	4,577	5,823	11,548	27,174	18,246	6,214	15,130	10,222	10,657
Chinese	2,192	4,327	1,971	1,485	770	1,263	1,841	1,770	1,307	1,608
Croatian, Slovenian	32,907	21,242	35,104	44,272	47,826	20,472	20,181	39,562	18,982	24,366
Cuban	2,944	4,811	7,259	5,591	5,475	3,323	3,380	3,331	3,914	3,155
Dalmatian, Bosnian, Herzegovinian	1,736	2,036	2,639	4,568	7,393	3,747	1,888	4,911	4,400	3,672
Dutch, Flemish	6,496	7,832	8,498	9,735	12,467	9,526	8,114	13,012	13,862	10,935
East Indian	83	258	145	271	1,072	1,710	337	1,782	517	165
English	28,451	41,479	50,865	45,079	51,126	49,056	39,021	53,498	57,258	49,689
Filipino	133	29	5	....	....	....	....	....	....	....
Finnish	18,864	10,157	17,012	14,136	14,860	6,746	11,687	15,736	9,779	6,641
French	7,166	11,557	11,347	10,379	9,392	12,881	19,423	21,107	18,132	18,382
German	71,782	74,790	82,360	86,813	92,936	73,038	58,534	71,380	66,471	65,343
Greek	14,376	12,625	12,144	23,127	46,283	28,808	20,262	39,135	37,021	31,566
Hebrew	76,203	106,236	129,910	153,748	149,182	103,387	57,551	84,260	91,223	80,595
Irish	35,366	37,076	54,266	40,959	38,706	36,427	31,185	38,382	40,246	33,922
Italian (north)	37,429	36,699	39,930	46,286	51,564	24,700	25,150	30,780	30,312	26,443
Italian (south)	196,117	159,329	186,390	240,528	242,497	110,547	165,248	192,673	159,638	135,830
Japanese	20,041	14,382	11,021	14,243	30,824	16,418	3,275	2,798	4,575	6,172
Korean	564	1,907	4,929	127	39	26	11	19	8	33
Lithuanian	14,432	12,780	18,604	14,257	25,884	13,720	15,254	22,714	17,027	14,078
Magyar	27,124	23,883	46,030	44,261	60,071	24,378	28,704	27,302	19,996	23,599
Mexican	486	447	227	141	91	5,682	15,591	17,760	18,784	22,001
Pacific Islander	52	12	17	13	3	2	7	61	12	3
Polish	82,343	67,757	102,437	95,835	138,033	68,105	77,565	128,348	71,446	85,163
Portuguese	8,433	6,338	4,855	8,729	9,648	6,809	4,606	7,657	7,469	9,403
Roumanian	4,740	4,364	7,818	11,425	19,200	9,629	8,041	14,199	5,311	8,329
Russian	3,608	3,961	3,746	5,814	16,807	17,111	10,038	17,294	18,721	22,558
Ruthenian (Russniak)	9,843	9,592	14,473	16,257	24,081	12,361	15,808	27,907	17,724	21,965
Scandinavian	79,347	61,029	62,284	58,141	53,425	32,789	34,906	52,037	45,859	31,601
Scotch	6,219	11,483	16,144	16,463	20,516	17,014	16,446	24,612	25,625	20,293
Slovak	34,427	27,940	52,368	38,221	42,041	16,170	22,586	32,416	21,415	25,281
Spanish	3,297	4,662	5,590	5,332	9,495	6,636	4,939	5,837	8,068	9,070
Spanish-American	978	1,666	1,658	1,585	1,060	1,063	890	900	1,153	1,342
Syrian	5,551	3,653	4,822	5,824	5,880	5,520	3,668	6,317	5,444	5,525
Turkish	449	1,482	2,145	2,033	1,902	2,327	820	1,283	918	1,336
Welsh	1,278	1,820	2,531	2,367	2,754	2,504	1,699	2,244	2,248	2,239
West Indian (except Cuban)	1,497	1,942	1,548	1,476	1,381	1,110	1,024	1,150	1,141	1,132
All other peoples	89	668	351	1,027	2,058	1,530	1,537	3,330	3,323	3,660
Total	857,046	812,870	1,026,499	1,100,735	1,285,349	782,870	751,786	1,041,570	878,587	838,172

TOTAL NUMBER OF IMMIGRANTS IN SPECIFIED YEARS, 1892 TO 1912: BY SEX AND AGE; ALSO IMMIGRANTS DEBARRED AND RETURNED WITHIN ONE YEAR AFTER ARRIVAL, AND ILLITERATES OVER 14 AND 16 YEARS OF AGE.

[Sources: Records of Bureau of Statistics prior to 1896; for subsequent years, reports of the Commissioner General of Immigration, Department of Commerce and Labor.]

Year ended June 30—	Total immigrants.	Sex.		Ages.			Debarred from landing.	Returned within 1 year after landing.	Returned within 3 years after landing.	Able to read, but not write.[1]	Unable to read or write.[1]
		Male.	Female.	Under 14 years.	14 to 45 years.	45 years and over.					
1892...	623,084	385,781	237,303	[2] 89,167	[3] 491,839	[4] 42,078	2,164	637	....	....	....
1893...	502,917	315,845	187,072	[2] 57,392	[3] 419,701	[4] 25,824	1,053	577	....	59,582	61,038
1894...	314,467	186,247	128,220	[2] 41,755	[3] 258,162	[4] 14,550	2,389	417	....	16,784	41,614
1895...	279,948	159,924	120,024	[2] 33,289	[3] 233,543	[4] 13,116	2,394	189	....	2,612	42,302
1896...	343,267	212,466	130,801	[2] 52,741	[3] 254,519	[4] 36,007	2,799	238	....	5,066	78,130
1897...	230,832	135,107	95,725	[2] 38,627	[3] 165,181	[4] 27,024	1,617	263	....	1,572	43,008
1898...	229,299	135,775	93,524	[2] 38,267	[3] 164,905	[4] 26,127	3,030	199	....	1,416	43,057
1899...	311,715	195,277	116,438	43,983	248,187	19,545	3,798	263	....	1,022	60,446
1900...	448,572	304,148	144,424	54,624	370,382	23,566	4,246	356	....	2,097	93,576
1901...	487,918	331,055	156,863	62,562	396,516	28,840	3,516	363	....	3,058	117,587
1902...	648,743	466,369	182,374	74,063	539,254	35,426	4,974	465	....	2,917	162,188
1903...	857,046	613,146	243,900	102,431	714,053	40,562	8,769	547	....	3,341	185,667
1904...	812,870	549,100	263,770	109,150	657,155	46,565	7,994	300	479	3,953	168,903
1905...	1,026,499	724,914	301,585	114,668	855,419	56,412	11,879	98	747	8,209	230,882
1906...	1,100,735	764,463	336,272	136,273	913,955	50,507	12,371	61	615	4,755	265,068
1907...	1,285,349	929,976	355,373	138,344	1,100,771	46,234	13,064	70	925	5,829	337,573
1908...	782,870	506,912	275,958	112,148	630,671	40,051	10,902	114	1,955	2,310	172,293
1909...	751,786	519,969	231,817	88,393	624,876	38,517	10,411	58	2,066	2,431	191,049
1910...	1,041,570	736,038	305,532	120,509	868,310	52,751	24,270	23	2,672	4,571	253,509
1911...	878,587	570,057	308,530	117,837	714,709	46,041	22,349	9	2,779	2,930	182,273
1912...	838,172	529,931	308,241	113,700	678,480	45,992	16,057	10	2,440	3,024	177,284

[1] For the years prior to 1895 the figures are for persons over 16 years; for 1895 to 1910 for persons 14 years of age and over.
[2] Under 15 years. [3] 15 to 40 years. [4] 40 years and over.

SUMMARY OF BOILER EXPLOSIONS.

A summary of the number of persons killed or injured, per explosions, for successive ten-year periods, shows that the boiler explosions of this country have been becoming less and less serious. In 1871 there were 89 explosions recorded, resulting in the death of 383 persons and injuries to 225, or 4.3 persons killed and 2.53 injured per explosion. In 1881 with 159 explosions, there were 251 persons killed and 313 injured, or 1.57 killed and 1.96 injured per explosion. In 1891, 257 explosions resulted in the death of 263 persons and injuries to 371, or 1.02 killed and 1.44 injured per explosion. In 1901, 423 explosions resulted in 312 deaths and injuries to 646, or 0.73 persons killed and 1.52 injured per explosion. In 1911, there were 499 explosions resulting in the death of 222 persons and injuries to 416, or 0.47 persons killed and 0.83 injured per explosion. This decrease is most probably due to the improvement that has taken place in the design, construction, and operation of steam boilers, and not to the increased use of sectional boilers, for experience has indicated that the bursting or rupture of such boilers is frequently attended with serious consequences in the way of killing or injuring the attendants.

Courtesy of "*The Locomotive*," Jan. 1909.

NET INCREASE OR DECREASE OF POPULATION BY ARRIVAL AND DEPARTURE OF ALIENS, FISCAL YEAR ENDED JUNE 30, 1912, BY RACES OR PEOPLES.

Race or people.	Admitted.			Departed.			Increase (+) or decrease (−).
	Immigrant aliens.	Nonimmigrant aliens.	Total.	Emigrant aliens.	Nonemigrant aliens.	Total.	
African (black)	6,759	3,098	9,857	1,288	2,389	3,677	+ 6,180
Armenian	5,222	189	5,411	718	361	1,079	+ 4,332
Bohemian and Moravian (Czech)	8,439	648	9,087	1,149	1,010	2,159	+ 6,928
Bulgarian, Servian, and Montenegrin	10,657	2,041	12,698	7,349	3,205	10,554	+ 2,144
Chinese	1,608	3,883	5,491	2,549	3,904	6,453	− 962
Croatian and Slavonian	24,366	2,473	26,839	13,963	4,291	18,254	+ 8,585
Cuban	3,155	3,076	6,231	1,963	6,659	8,622	− 2,391
Dalmatian, Bosnian, and Herzegovinian	3,672	266	3,938	927	454	1,381	+ 2,557
Dutch and Flemish	10,935	3,205	14,140	1,816	4,721	6,537	+ 7,603
East Indian	165	56	221	164	148	312	− 91
English	49,689	36,360	86,049	10,341	54,116	64,457	+ 21,592
Finnish	6,641	1,049	7,690	4,148	3,040	7,188	+ 502
French	18,382	5,786	24,168	4,189	7,288	11,477	+ 12,691
German	65,343	17,055	82,398	15,026	22,549	37,575	+ 44,823
Greek	31,566	2,086	33,652	13,323	5,700	19,023	+ 14,629
Hebrew	80,595	3,407	84,002	7,418	5,027	12,445	+ 71,557
Irish	33,922	10,100	44,022	4,086	13,888	17,974	+ 26,048
Italian (north)	26,443	7,800	34,243	13,006	12,851	25,857	+ 8,386
Italian (south)	135,830	19,850	155,852	96,881	42,540	139,421	+ 16,431
Japanese	6,172	2,574	8,574	1,501	6,529	8,030	+ 544
Korean	33	7	40	55	18	73	− 33
Lithuanian	14,078	499	14,577	4,141	1,549	5,690	+ 8,887
Magyar	23,599	3,244	26,843	17,575	8,315	25,890	+ 953
Mexican	22,001	3,701	25,702	325	1,820	2,145	+ 23,557
Pacific Islander	3	10	13	4	13	17	− 4
Polish	85,163	6,056	91,219	37,764	11,977	49,741	+ 41,478
Portuguese	9,403	1,171	10,574	1,747	1,716	3,463	+ 7,111
Roumanian	8,329	1,101	9,430	5,824	2,256	8,080	+ 1,350
Russian	22,558	2,918	25,476	9,744	5,488	15,232	+ 10,244
Ruthenian (Russniak)	21,965	4,714	26,679	5,521	4,986	10,507	+ 16,172
Scandinavian (Norwegians, Danes, and Swedes)	31,601	10,239	41,840	10,380	15,711	26,091	+ 15,749
Scotch	20,293	8,335	28,628	3,456	10,846	14,302	+ 14,326
Slovak	25,281	2,061	27,342	12,526	4,361	16,887	+ 10,455
Spanish	9,070	4,905	13,975	2,569	4,661	7,230	+ 6,745
Spanish-American	1,342	1,708	3,050	343	1,935	2,278	+ 772
Syrian	5,525	580	6,105	972	1,339	2,311	+ 3,794
Turkish	1,336	94	1,430	1,366	710	2,076	− 646
Welsh	2,239	858	3,097	301	833	1,134	+ 1,963
West Indian (except Cuban)	1,132	1,293	2,425	530	1,569	2,099	+ 326
Other peoples	3,660	487	4,147	1,113	1,257	2,370	+ 1,777
Not specified[1]	....	....	....	15,201	....	15,201	− 15,201
Total	838,172	178,983	1,017,155	333,262	282,030	615,292	+401,863
Admitted in and departed from Philippine Islands	2,536	6,932	9,468	729	8,776	9,505	− 37

[1] Departed via Canadian border. Reported by Canadian Government as Canadians.

ARRIVALS OF PASSENGERS AT THE PORTS OF THE UNITED STATES.

The total number of passengers that arrived at the various ports of the United States during the year 1900 was 594,478, of which number 120,477 were United States citizens returning from foreign countries; 25,429 were non-immigrant aliens; and 448,572 were immigrants. In 1905 the total number of passengers arriving at the ports of the United States was 1,234,615, and of this number 167,227 were United States citizens returning to the States; 40,889 were non-immigrant aliens; and 1,026,499 immigrants. For the year 1911 the total number of passengers arriving at the ports of the United States was 1,299,428, of which number 269,128 were United States citizens returning home; 151,713 were non-immigrant aliens; and 878,587 were immigrants. In 1912, the total number of passengers arriving at the ports of the United States was 1,297,956, of which number 280,801 were United States citizens returning home; 178,983 were non-immigrant aliens and 838,172 were immigrants.

SEX, AGE, LITERACY, FINANCIAL CONDITION, ETC., OF IMMIGRANT

Race or people.	Number admitted.	Sex.		Age.			Literacy, 14 years and over			
							Can read but can not write.		Can neither read nor write.	
		Male.	Female.	Under 14 years.	14 to 44 years.	45 years and over.	Male.	Female.	Male.	Female.
African (black)	6,759	3,828	2,931	614	5,844	301	19	22	894	291
Armenian	5,222	4,476	746	290	4,779	153	7	......	1,000	182
Bohemian and Moravian (Czech)	8,439	4,565	3,874	1,610	6,339	490	4	5	16	59
Bulgarian, Servian and Montenegrin	10,657	9,626	1,031	453	9,945	259	15	1	2,995	341
Chinese	1,608	1,367	241	207	1,327	74	......	......	8	163
Croatian and Slovenian	24,366	17,383	6,983	2,063	21,660	643	5	5	4,545	1,591
Cuban	3,155	2,098	1,057	455	2,389	311	2	1	25	29
Dalmatian, Bosnian and Herzegovinian	3,672	3,152	520	130	3,466	76	3	......	1,247	170
Dutch and Flemish	10,935	6,808	4,127	2,352	7,758	825	......	3	86	70
East Indian	165	153	12	2	157	6	......	......	9	......
English	49,689	27,133	22,556	8,395	35,774	5,520	13	17	116	124
Finnish	6,641	3,354	3,287	713	5,769	159	2	4	28	32
French	18,382	10,327	8,055	3,320	13,019	2,043	18	16	775	308
German	65,343	36,479	28,864	11,484	49,340	4,519	44	68	1,272	1,464
Greek	31,566	28,521	3,045	1,144	29,976	446	4	4	5,465	1,405
Hebrew	80,595	42,751	37,844	20,091	54,927	5,577	223	70	5,637	9,498
Irish	33,922	17,012	16,910	2,357	29,671	1,894	11	13	219	171
Italian (North)	26,443	18,507	7,936	3,033	22,334	1,076	6	3	884	451
Italian (South)	135,830	94,460	41,370	20,081	107,216	8,533	24	8	36,481	18,165
Japanese	6,172	1,930	4,242	328	5,546	298	4	6	232	1,503
Korean	33	14	19	2	30	1	......	......	3	7
Lithuanian	14,078	8,098	5,980	1,186	12,635	257	193	326	3,104	3,359
Magyar	23,599	13,792	9,807	3,740	18,697	1,162	......	7	1,253	903
Mexican	22,001	15,367	6,634	4,188	15,910	1,903	27	28	7,035	2,711
Pacific Islander	3	2	1	......	3	......	......	......	......	......
Polish	85,163	50,028	35,135	8,477	74,911	1,775	603	953	14,563	11,444
Portuguese	9,403	5,938	3,465	1,863	6,939	601	8	2	2,661	1,563
Roumanian	8,329	6,752	1,577	484	7,304	541	5	......	2,302	561
Russian	22,558	19,464	3,094	1,043	21,114	401	45	6	6,894	1,537
Ruthenian (Russniak)	21,965	13,121	8,844	1,255	20,314	396	36	34	5,218	3,816
Scandinavian (Norwegian Danes and Swedes)	31,601	19,073	12,528	2,867	27,270	1,464	5	13	32	17
Scotch	20,293	10,637	9,656	3,593	14,593	2,107	3	5	44	34
Slovak	25,281	15,639	9,642	2,997	21,519	765	19	18	2,567	1,540
Spanish	9,070	6,900	2,170	1,294	7,196	580	13	3	1,052	596
Spanish-American	1,342	930	412	193	1,029	120	1	......	14	12
Syrian	5,525	3,646	1,879	761	4,475	289	5	6	1,161	1,024
Turkish	1,336	1,256	80	25	1,283	28	......	......	642	30
Welsh	2,239	1,419	820	344	1,697	198	......	......	2	10
West Indian (except Cuban)	1,132	590	542	115	902	115	5	1	19	5
Other peoples	3,660	3,335	325	151	3,423	86	4	......	1,498	100
Total	838,172	529,931	308,241	113,700	678,480	45,992	1,376	1,648	111,998	65,286
Admitted in Philippine Islands	2,536	2,098	438	547	1,912	77	......	......	151	83

ILLITERACY IN THE UNITED STATES.

The statement shows that in 1910 there were 71,580,270 persons 10 years of age or over in the United States, of whom 5,516,163 were unable to read or write, constituting 7.7 per cent. of the population.

The native whites, who constituted nearly 75.0 per cent. of the entire population, had the smallest number of illiterates, 1,534,272, or 3.0 per cent.

The foreign born whites had 1,650,361 illiterates, or 12.7 per cent. of their number.

The colored had 2,331,530 illiterates, or 30.5 per cent.

Aliens Admitted, Fiscal Year Ended June 30, 1912, by Races or Peoples.

Money.			By whom passage was paid.			Going to join—		
Aliens bringing—		Total amount of money shown.	Self.	Relative.	Other than self or relative.	Relative.	Friend.	Neither relative nor friend.
$50 or over.	Less than $50.							
978	4,572	177,831	4,984	1,524	251	4,325	896	1,538
437	4,150	150,961	4,470	731	21	4,275	856	91
1,264	4,497	370,273	4,866	3,504	69	6,933	1,290	216
615	9,088	298,092	9,435	1,191	31	4,918	5,343	396
468	997	73,603	448	1,051	109	977	351	280
1,334	19.828	607,850	19,347	4,886	133	17,531	6,431	404
1,817	536	157,726	1,908	1,212	35	1,014	327	1,814
295	2,878	100,288	3,231	415	26	2,496	1,023	153
2,985	3,615	578,438	5,993	4,784	158	7,220	2,784	931
138	21	25,294	132	26	7	50	45	70
18,891	14,518	4,061,994	29,822	18,502	1,365	30,501	9,159	10,029
1,129	4,227	271,830	3,951	2,381	309	4,108	2,142	391
5,668	5.911	1,155,563	10,695	6,980	707	11,967	2,338	4,077
17,125	26,001	3,543,030	37,871	26,258	1,214	47,906	12,143	5,294
2,737	25.189	1,052,329	28,577	2,971	18	23,052	7,795	719
7,031	33,323	1,969,268	25,772	54,539	284	76,063	3,026	1,506
6,234	21,260	1,633,038	20.731	12,764	427	28,248	3,130	2,544
4,838	16,755	995,218	19,627	6,533	283	20,249	4,945	1,249
11,108	91.903	3,419,053	92,560	42,826	444	128,412	6,277	1,141
2,914	2,441	240,201	907	5,198	67	5,246	324	602
12	10	1,092	6	26	1	23	9	1
590	10,552	299,534	7,221	6,784	73	13,230	779	69
2,082	15,334	633,289	14.819	8,708	72	19,092	3,596	911
1,160	11,494	301,079	13,845	7,895	261	8,686	1,013	12,302
2	....	100	2	....	1	1	1	1
3,205	66,467	1,930,269	55,733	29,233	197	77,240	6,730	1,193
814	5,179	201,850	5,118	3,148	1,137	6,666	1,980	757
454	6.641	209,722	6,663	1,643	23	5,261	2,573	495
1,089	18,679	599,741	19,287	2,959	312	13,064	8,621	873
431	19,424	507,433	17,603	4,299	63	17,947	3,288	730
6,612	20,266	1,495,773	22,390	8,541	670	20,617	8,018	2,966
6,692	7,485	1,562,570	12,948	7,069	276	13,695	3,842	2,756
1,176	19,962	577,071	19,478	5,764	39	22,752	2,182	347
2,464	3,387	404,056	5,391	1,387	2,292	3,556	1,529	3,985
895	108	163,312	758	481	103	357	211	774
955	2,925	209,358	3,480	1,991	54	4,641	623	261
130	1,071	47,196	1,238	94	4	947	308	81
930	714	148,421	1,435	737	67	1,439	514	286
517	410	67,917	803	292	37	594	173	365
305	2,968	112,058	3,257	330	73	2,208	1,245	207
118,521	504,986	30,353,721	536,802	289,657	11,713	657,507	117,860	62,805
1,225	740	16,352	1,420	1,078	38	1,130	199	1,207

FATALITIES OF SPORT.

During the year 1912, 433 persons were killed in the various branches of sport and over 2,000 injured. The killed and injured in some of the sports follow:

	Killed.	Injured.		Killed.	Injured.
July 4 and other celebrations	41	947	Wrestling................	2	3
Baseball..................	24	57	Didn't know it was loaded...	48	..
Football..................	17	184	Prizefighting.............	7	..
Bicycles and motor cycles...	134	648	Polo......................	..	8
Horse racing..................	6	..	Hunting.................	153	162

If the real capacity of power propelled machinery is to be gained in city transportation, fast and vehicular traffic must be segregated. Each type of transport will then be free to develop itself along its own lines.

THE ELEVATED SIDEWALK: HOW IT WILL SOLVE CITY TRANSPORTATION PROBLEMS.

INTENDED FUTURE PERMANENT RESIDENCE OF ALIENS ADMITTED AND LAST PERMANENT RESIDENCE OF ALIENS DEPARTED, FISCAL YEAR ENDED JUNE 30, 1912.

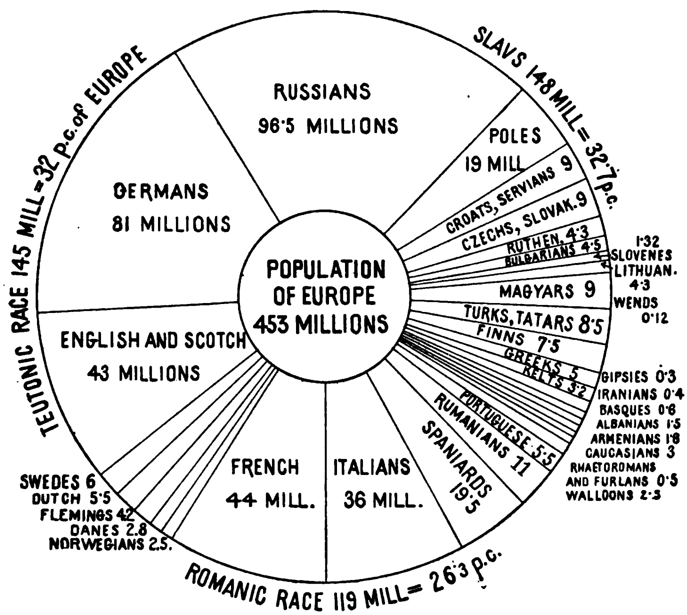
State or Territory.	Admitted.		Departed.	
	Immigrant aliens.	Nonimmigrant aliens.	Emigrant aliens.	Nonemigrant aliens.
Alabama	988	107	280	188
Alaska	276	68	95	97
Arizona	2,902	1,058	272	240
Arkansas	313	41	114	70
California	28,905	4,601	7,578	6,900
Colorado	4,215	410	1,725	1,064
Connecticut	23,227	2,049	7,437	3,160
Delaware	1,081	110	317	79
District of Columbia	1,685	317	369	308
Florida	5,356	2,806	3,048	2,798
Georgia	825	116	158	102
Hawaii	6,654	951	907	2,024
Idaho	1,480	127	356	364
Illinois	67,118	5,919	28,355	11,796
Indiana	7,753	657	4,718	1,194
Iowa	7,147	589	1,302	1,051
Kansas	2,901	220	767	412
Kentucky	727	94	210	138
Louisiana	1,811	371	538	269
Maine	5,691	235	777	488
Maryland	5,413	424	1,422	538
Massachusetts	70,171	8,142	15,406	10,671
Michigan	33,559	3,210	8,161	4,465
Minnesota	12,149	1,298	4,987	2,946
Mississippi	329	52	100	85
Missouri	8,980	872	4,030	2,097
Montana	3,565	343	963	897
Nebraska	4,490	353	928	708
Nevada	1,026	94	248	214
New Hampshire	6,120	258	1,451	543
New Jersey	47,211	5,009	17,278	6,106
New Mexico	757	141	211	294
New York	239,275	27,437	84,533	36,763
North Carolina	421	53	45	64
North Dakota	3,947	262	385	528
Ohio	38.148	3,065	18,473	8,125
Oklahoma	681	72	261	122
Oregon	4.138	463	1,873	1,286
Pennsylvania	109.625	10,216	60,528	17,180
Philippine Islands	13	14	5	3
Porto Rico	1.406	650	423	207
Rhode Island	9,795	1,128	2,779	1,582
South Carolina	275	33	54	39
South Dakota	1,792	194	252	243
Tennessee	797	111	121	115
Texas	22,885	2,114	644	415
Utah	2,631	221	1,095	731
Vermont	2,847	259	714	361
Virginia	1,510	166	426	222
Washington	11,882	1,261	3.580	2,756
West Virginia	6,212	507	4,263	1,641
Wisconsin	14,016	1,050	4,726	1,632
Wyoming	1,051	140	494	332
Outside United States	....	88,525	....	145,377
Unknown [2]	....	....	33,080	....
Total	838,172	178,983	333,262	282.030

OCCUPATION OF ALIENS.

Occupation.	Admitted.		Departed.	
	Immigrant aliens.	Nonimmigrant aliens.	Emigrant aliens.	Nonemigrant aliens.
PROFESSIONAL.				
Actors	873	970	325	1,303
Architects	288	256	86	404
Clergy	1,063	1,028	349	1,334
Editors	136	185	44	265
Electricians	741	306	124	367
Engineers (professional)	1,563	2,118	443	2,545
Lawyers	293	596	41	840
Literary and scientific persons	425	457	80	440
Musicians	1,286	703	281	959
Officials (Government)	382	780	134	1,015
Physicians	459	789	131	1,126
Sculptors and artists	587	304	167	544
Teachers	2,035	1,211	517	1,671
Other professional	1,554	896	334	1,365
Total professional	11,685	10,599	3,056	14,178
SKILLED.				
Bakers	3,678	751	650	814
Barbers and hairdressers	3,100	554	676	666
Blacksmiths	3,954	645	492	704
Bookbinders	396	42	19	65
Brewers	165	91	41	114
Butchers	3,143	573	464	665
Cabinetmakers	345	95	175	282
Carpenters and joiners	11,034	2,557	2,081	3,888
Cigarette makers	82	23	9	10
Cigar makers	720	1,109	1,157	2,040
Cigar packers	112	94	19	30
Clerks and accountants	12,701	5,381	1,850	6,384
Dressmakers	5,244	743	516	903
Engineers (locomotive, marine, and stationary)	1,331	1,063	272	1,048
Furriers and fur workers	565	69	126	106
Gardeners	1,391	622	256	776
Hat and cap makers	533	79	63	83
Iron and steel workers	1,366	417	497	743
Jewelers	300	122	82	179
Locksmiths	1,883	162	47	73
Machinists	2,098	901	883	1,816
Mariners	4,124	2,251	625	1,774
Masons	4,555	1,340	731	1,582
Mechanics (not specified)	1,342	493	4,139	681
Metal workers (other than iron, steel, and tin)	669	126	85	181
Millers	588	79	38	69
Milliners	1,006	153	111	164
Miners	5,889	1,468	10,911	7,295
Painters and glaziers	2,816	651	438	883
Pattern makers	71	43	25	65
Photographers	351	113	65	119
Plasterers	319	234	135	268
Plumbers	584	259	90	362
Printers	953	244	102	305
Saddlers and harness makers	416	41	28	46
Seamstresses	7,636	387	257	336
Shoemakers	8,671	850	1,123	1,007
Stokers	1,169	431	729	553
Stonecutters	972	262	298	466
Tailors	18,836	1,486	2,650	1,797
Tanners and curriers	385	39	57	61
Textile workers (not specified)	1,051	239	756	851
Tinners	737	104	102	135
Tobacco workers	66	77	14	69
Upholsterers	231	49	31	89
Watch and clock makers	572	70	49	94
Weavers and spinners	2,909	513	482	775
Wheelwrights	262	32	17	42
Woodworkers (not specified)	324	63	44	110
Other skilled	5,371	2,081	1,391	2,549
Total skilled	127,016	30,271	35,898	44,117

OCCUPATION OF ALIENS—Continued.

Occupation.	Admitted.		Departed.	
	Immigrant aliens.	Nonimmigrant aliens.	Emigrant aliens.	Nonemigrant aliens.
MISCELLANEOUS.				
Agents	1,081	1,497	194	1,865
Bankers	257	759	99	1,266
Draymen, hackmen, and teamsters	822	276	223	442
Farm laborers	184,154	27,091	3,978	16,743
Farmers	7,664	3,985	7,807	7,940
Fishermen	755	286	202	384
Hotel keepers	277	340	148	479
Laborers	135,726	21,673	209,279	80,616
Manufacturers	416	697	98	1,175
Merchants and dealers	10,240	10,958	5,654	15,081
Servants	116,529	16,737	13,449	21,239
Other miscellaneous	10,480	6,351	3,696	9,083
Total miscellaneous	468,401	90,650	244,827	156,313
No occupation (including women and children)	231,070	47,463	49,481	67,422
Grand total	838,172	178,983	333,262	282,030



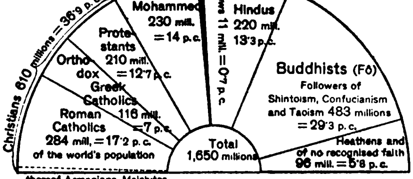
THE RACES OF MANKIND.

RELIGIONS OF THE UNITED STATES.

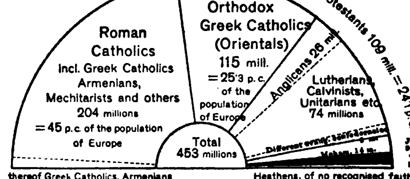
DENOMINATIONS.	Summary for 1912. Ministers.	Churches.	Communicants.
Adventists (6 bodies)	1,172	2,522	95,608
Baptists (15 bodies)	41,419	56,918	5,894,232
Brethren (Dunkards, 4 bodies)	3,484	1,239	119,644
Brethren (Plymouth, 4 bodies)	....	403	10,566
Brethren (River, 3 bodies)	224	105	4,903
Buddhists (2 bodies)	15	74	3,165
Catholic Apostolic (2 bodies)	33	24	4,927
Catholic (Eastern Orthodox, 7 bodies)	263	274	434,000
Catholic (Western, 3 bodies)	17,645	14,132	12,907,189
Christadelphians	....	70	1,412
Christians	1,129	1,182	102,902
Christian Catholic (Dowie)	35	17	5,865
Christian Scientists	2,460	1,230	85,096
Christian Union	295	237	13,905
Church of God (Winebrennarian)	509	595	41,475
Church of the Living God (Colored, 3 bodies)	101	68	4,286
Church of the New Jerusalem (2 bodies)	128	143	9,554
Communistic Societies (2 bodies)	....	22	2,272
Congregationalists	6,125	6,070	742,350
Disciples of Christ (2 bodies)	8,054	12,467	1,497,545
Evangelical (2 bodies)	1,523	2,627	184,866
Faith Associations (9 bodies)	241	146	9,572
Free Christian Zion Church	20	15	1,835
Friends (4 bodies)	1,476	1,167	124,216
Friends of the Temple	3	3	376
German Evangelical Protestant	59	66	34,704
German Evangelical Synod	1,038	1,326	258,911
Jewish Congregations	1,084	1,769	143,000
Latter-Day Saints (2 bodies)	3,360	1,420	352,500
Lutherans (23 bodies)	9,038	14,566	2,353,702
Scandinavian Evangelical (3 bodies)	611	848	70,500
Mennonites (12 bodies)	1,087	635	57,219
Methodists (16 bodies)	42,849	61,027	6,905,095
Moravians (2 bodies)	149	143	19,970
Non-Sectarian Bible Faith Churches	50	204	6,396
Pentecostal (2 bodies)	732	510	22,416
Presbyterians (12 bodies)	13,576	16,776	1,981,949
Protestant Episcopal (2 bodies)	5,516	7,804	980,851
Reformed (4 bodies)	2,113	2,653	459,106
Salvationists (2 bodies)	2,994	872	27,345
Schwenkfelders	6	8	941
Social Brethren	15	17	1,262
Society for Ethical Culture	7	6	2,450
Spiritualists	....	2,000	200,000
Theosophical Society	....	134	3,368
Unitarians	527	476	70,542
United Brethren (2 bodies)	2,262	4,216	320,960
Universalists	702	709	51,716
Independent Congregations	267	879	48,673
Grand Total for 1912	174,396	220,814	36,675,357
Grand Total for 1911	171,905	220,160	36,095,685

d Decrease. *c* Census of 1906.

The Religions of Mankind
according to the numbers of their adherents.



The Religions of Europe
according to the numbers of their adherents.



ORDER OF DENOMINATIONS.

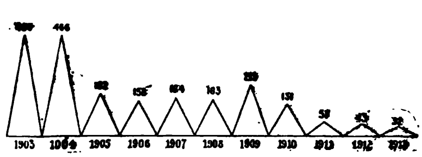
Denominations.	Rank in 1912.	Communicants.	Rank in 1890.	Communicants.
Roman Catholic	1	12,888,466	1	6,231,417
Methodist Episcopal	2	3,293,526	2	2,240,354
Regular Baptist (South)	3	2,475,609	4	1,280,066
Methodist Episcopal (South)	4	1,919,873	5	1,209,976
Regular Baptist (Colored)	5	1,912,219	3	1,348,989
Presbyterian (Northern)	6	1,368,150	7	788,244
Disciples of Christ	7	1,340,887	8	641,051
Regular Baptist (North)	8	1,175,923	6	800,450
Protestant Episcopal	9	970,451	9	532,054
Lutheran Synodical Conference	10	807,693	12	357,153
Congregationalist	11	742,350	10	512,771
African Methodist Episcopal	12	620,234	11	452,725
African Methodist Episcopal Zion	13	547,216	13	349,788
Lutheran General Council	14	473,295	14	324,846
Lutheran General Synod	15	316,949	20	164,640
United Brethren	16	301,448	16	202,474
Reformed (German)	17	300,147	15	204,018
Latter-Day Saints	18	296,000	21	144,352
Presbyterian (Southern)	19	292,845	18	179,721
German Evangelical Synod	20	258,911	17	187,432
Colored Methodist Episcopal	21	234,721	24	129,383
Spiritualists	22	200,000	39	45,030
Methodist Protestant	23	183,318	22	141,989
Greek Orthodox (Catholic)	24	175,000	138	100
United Norwegian Lutheran	25	169,710	26	119,972
United Presbyterian	26	139,617	27	94,402
Lutheran Synod of Ohio	27	132,316	33	69,505
Reformed (Dutch)	28	118,564	28	92,970
Orthodox Friends	29	100,568	31	80,655

ORDER OF DENOMINATIONAL FAMILIES.

Denominational Families.	Rank in 1912.	Communicants.	Rank in 1890.	Communicants.
Catholic (Roman, etc.)	1	12,907,189	1	6,257,871
Methodist	2	6,905,095	2	4,589,284
Baptist	3	5,894,232	3	3,717,969
Lutheran	4	2,353,702	5	1,231,072
Presbyterian	5	1,981,949	4	1,278,362
Episcopal	6	980,851	6	540,509
Reformed	7	459,106	7	309,458
Latter-Day Saints	8	352,500	9	166,125
United Brethren	9	320,960	8	225,281
Friends	10	124,216	11	107,208
Brethren (Dunkard)	11	119,644	13	73,795
Adventists	12	95,808	14	60,491

—*Courtesy of the Christian Advocate.*

FOURTH OF JULY FATALITIES.



Fourth of July fatalities in 1913 were reduced to 32 as a result of the movement to do away with the old custom of causing dangerous explosions for fun. In 1912 there had been 43 deaths. The number of persons injured in 1913 was 1,131 as against 988 in 1912 and 1,546 in 1911. The loss sustained by Fourth of July fires caused by gunpowder throughout the country exceeded half a million dollars.

PENSION ACT APPROVED MAY 11, 1912.

That any person who served ninety days or more in the military or naval service of the United States during the late Civil War, who has been honorably discharged therefrom, and who has reached the age of sixty-two or over, shall, upon making proof of such facts, according to such rules and regulations as the Secretary of the Interior may provide, be placed upon the pension roll and be entitled to receive a pension as follows: In case such person has reached the age of sixty-two years and served ninety days, thirteen dollars per month; six months, thirteen dollars and fifty cents per month; one year, fourteen dollars per month; one and a half years, fourteen dollars and fifty cents per month; two years, fifteen dollars per month; two and a half years, fifteen dollars and fifty cents per month; three years or over, sixteen dollars per month. In case such person has reached the age of sixty-six years and served ninety days, fifteen dollars per month; six months, fifteen dollars and fifty cents per month; one year, sixteen dollars per month; one and a half years, sixteen dollars and fifty cents per month; two years, seventeen dollars per month; two and a half years, eighteen dollars per month; three years or over, nineteen dollars per month. In case such person has reached the age of seventy years and served ninety days, eighteen dollars per month; six months, nineteen dollars per month; one year, twenty dollars per month; one and a half years, twenty-one dollars and fifty cents per month; two years, twenty-three dollars per month; two and a half years, twenty-four dollars per month; three years or over, twenty-five dollars per month. In case such person has reached the age of seventy-five years and served ninety days, twenty-one dollars per month; six months, twenty-two dollars and fifty cents per month; one year, twenty-four dollars per month; one and a half years, twenty-seven dollars per month; two years or over, thirty dollars per month. That any person who served in the military or naval service of the United States during the Civil War and received an honorable discharge and who was wounded in battle or in line of duty and is now unfit for manual labor by reason thereof, or who from disease or other causes incurred in line of duty resulting in his disability is now unable to perform manual labor, shall be paid the maximum pension under this Act, to wit, thirty dollars per month, without regard to length of service or age.

That any person who has served sixty days or more in the military or naval service of the United States in the War with Mexico and has been honorably discharged therefrom, shall, upon making like proof of such service, be entitled to receive a pension of thirty dollars per month.

All of the aforesaid pensions shall commence from the date of filing of the applications in the Bureau of Pensions after the passage and approval of this Act: *Provided*, That pensioners who are sixty-two years of age or over, and who are now receiving pensions under existing laws, or whose claims are pending in the Bureau of Pensions, may, by application to the Commissioner of Pensions, in such form as he may prescribe, receive the benefits of this Act; and nothing herein contained shall prevent any pensioner or person entitled to a pension from prosecuting his claim and receiving a pension under any other general or special Act: *Provided*, That no person shall receive a pension under any other law at the same time or for the same period that he is receiving a pension under the provisions of this Act: *Provided further*, That no person who is now receiving or shall hereafter receive a greater pension, under any other general or special law, than he would be entitled to receive under the provisions herein shall be pensionable under this act.

SEC. 2. That rank in the service shall not be considered in applications filed hereunder.

SEC. 3. That no pension attorney, claim agent, or other person shall be entitled to receive any compensation for services rendered in presenting any claim to the Bureau of Pensions, or securing any pension, under this Act, except in applications for original pension by persons who have not heretofore received a pension.

SEC. 4. That the benefits of this Act shall include any person who served during the late Civil War, or in the War with Mexico, and who is now or may hereafter become entitled to pension under the Acts of June twenty-seventh, eighteen hundred and ninety, February fifteenth, eighteen hundred and ninety-five, and the joint resolutions of July first, nineteen hundred and two, and June twenty-eighth, nineteen hundred and six, or the Acts of January twenty-ninth, eighteen hundred and eighty-seven, March third, eighteen hundred and ninety-one, and February seventeenth, eighteen hundred and ninety-seven.

SEC. 5. That it shall be the duty of the Commissioner of Pensions, as each application for pension under this Act is adjudicated, to cause to be kept a record showing the name and length of service of each claimant, the monthly rate of payment granted to or received by him, and the county and state of his residence; and shall at the end of the fiscal year nineteen hundred and fourteen tabulate the record so obtained by States and counties, and shall furnish certified copies thereof upon demand and the payment of such fee therefor as is provided by law for certified copies of records in the executive departments.

PENSIONS.

On June 30, 1912, the pensioners on the roll of the United States Government were as follows: War of 1812, widows, 238; Indian wars, survivors, 1,210, widows, 2,439; War with Mexico, survivors, 1,313, widows, 5,533; Civil War, by Act of May 11, 1912, survivors, 13.246; by Act of Feb. 6, 1907, survivors 333,579; by the general law, invalids, 103,237 widows 64,135, minor children 351, mothers 1,413, fathers 202, brothers, sisters, sons and daughters 331, helpless children 515; by the Act of April 27, 1890, invalids 47,201, minor children 4,063, helpless children 416; by the Act of April 19, 1908, widows 232,947, army

nurses 362. War with Spain, invalids 23,841, widows 1,238, minor children 304, mothers 2,951, fathers 508, brothers, sisters, sons and daughters 6, helpless children 2. By regular establishment, invalids 14,373, widows 2,869, minor children 171, mothers 1,129, fathers 159, brothers, sisters, sons and daughters 4, helpless children 8. Thus the total number of pensioners on June 30, 1912 was 860,294; the number of soldiers and sailors on the pension roll at the close of the year was 538,000, the number of dependents and widows was 321,932, and the number of army nurses was 362.

The total amount available for pensions for the fiscal year ended June 30, 1912 was $153,004,727.89, and of this amount $152,986,433.72 was disbursed, leaving an unexpended balance of $18,294.17. The amount expended for Navy pensions was $5,319,822.08.

With the total number of pensioners 860,294, and the total annual value of the pensions $151,558,141.40, the average value of each pension for all classes amounts to $176.17; by regular establishment each pension has an annual average value of $174.33; by Act of May 11, 1913, $260.09; by Act of Feb. 6, 1907, $176.41; by the general law, Civil War, $221.71; by Act of June 27, 1890, $144.79; by Act of April 19, 1908, $144.76; by the war with Spain, $128.82; for survivors of the Civil War, $197.09.

Beginning with the year 1866 the number of pensioners for certain years was as follows:

1866, 126,722;	1870, 198,686;	1875, 234,821;
1880, 250,802;	1885, 345,125;	1890, 537,944;
1895, 970,524;	1900, 993,529;	1905, 998,441;
1910, 921,083;	1911, 892,098;	1912, 860,294.

PENSIONS OF THE SEVERAL WARS AND OF THE PEACE ESTABLISHMENT.

The amounts that have been paid for pensions to soldiers, sailors, and marines, their widows, minor children, and dependent relatives on account of military and naval service in the several wars and in the regular service since the foundation of the Government to June 30, 1912, are as follows:

War of the Revolution (estimate)	$70,000,000.00
War of 1812 (service pension)	45,890,843.39
Indian wars (service pension)	11,713,609.51
War with Mexico (service pension)	46,447,872.44
Civil War	4,129,699,071.99
War with Spain and insurrection in Philippine Isls.	38,114,062.42
Regular establishment	25,014,227.64
Unclassified	16,488,476.49
Total disbursements for pensions	$4,383,368,163.88

HISTORICAL

There are now no pensioners on account of the Revolutionary War on the roll, the last pensioner of that war having died during the year 1906. The last survivor of the Revolution was Daniel F. Bakeman, who died at Freedom, Cattaraugas County, N. Y., on April 5, 1869, aged 100 years 6 months and 8 days.

The last surviving pensioned soldier of the War of 1812 was Hiram Cronk, of Ava, N. Y., who died May 13, 1905, aged 105 years and 16 days.

POPULATION OF CANADA.

The population of Canada by first census of 1665 was 3,251; in 1763, 70,000; in 1871, 3,485,761; in 1881, 4,324,810; in 1891, 4,833,239; in 1901, 5,371,315. Canada began the 20th century with the same population as the United States began the 19th. Revised returns of the census in 1911 give the population at 7,204,838, an increase of 1,833,523, or 32 per cent. in ten years.

The population of Canada by provinces, as shown by the census of 1901 and 1911, is as follows:

	1911	1901
Alberta	374,663	73,022
British Columbia	392,480	178,657
Manitoba	455,614	255,211
New Brunswick	351,889	331,120
Nova Scotia	492,338	459,574
Ontario	2,523,274	2,182,947
Prince Edward Island	93,728	103,259
Quebec	2,002,712	1,648,898
Saskatchewan	492,432	91,279
Northwest Territories	17,196	20,129
Yukon	8,512	27,129
	7,204,838	5,371,315

RHODES SCHOLARSHIPS.

Under the will of Mr. Cecil Rhodes a number of Colonial, American and German scholarships were established, in order to instill into the minds of colonists the advantage to the Colonies as well as to the United Kingdom of the retention of the unity of the Empire; to encourage in the students from the United States of America an attachment to the country from which they have sprung; and to further a good understanding between England, Germany, and the United States.

There are in all seventy-eight colonial scholarships for male students of $1,500 each a year for three years at the University of Oxford, these colonial scholarships being spread over most of the colonies, twenty-four being allotted to Canada, eighteen to Australia, twelve to Cape Colony, nine to Rhodesia, and three each to Natal, New Zealand, Newfoundland, Bermuda and Jamaica.

Two Oxford scholarships are to be allotted to each State and Territory of the United States of America, tenable for three years, each of $1,500; also, five German scholarships, each of $1,250, tenable at Oxford for three years, the holders to be nominated by the German Emperor.

So that the students who shall be elected to the scholarships shall not be merely bookworms, regard is to be had, not only to their "literary and scholastic attainments," but also to their "fondness of and success in manly outdoor sports, qualities of manhood, truth, courage, devotion to duty, sympathy for and protection of the weak, kindliness, unselfishness, and fellowship," moral force of character and instinct of leadership. "No student shall be qualified or disqualified for election to a scholarship on account of his race or religious opinion."

EDUCATION.

School Attendance in the United States.

The statistics relative to school attendance in the United States has just become available. The total number of persons of school age, that is to say, from 6 to 20 years, inclusive, in continental United States in 1910 was 27,750,599, of whom 17,300,202, or 62.3 per cent. attended school.

Persons from 6 to 9 years of age numbered 7,725,234, of whom 5,678,320, or 73.5 per cent. attended school, while those from 10 to 14 years of age numbered 9,107,140, of whom 8,028,660, or 88.2 per cent. attended school.

Of the whole number of persons from 15 to 17 years of age, namely, 5,372,177, those attending school numbered 2,748,387, or 51.2 per cent., while of the 5,546,048 persons from 18 to 20 years of age, there were 844,835, or 15.2 per cent. who attended school.

For the combined group, 6 to 14 years, inclusive—the most common years of school attendance—there was a total of 16,832,374 persons reported in 1910 and of this number 13,706,980, or 81.4 per cent., attended school.

It will be noted that the period of maximum school attendance is in the ages 10 to 14 years. For these years a comparison can be made with the census of 1900. In 1900, 79.8 per cent. of the children attended school, as compared with 88.2 per cent. in 1910. The following summary gives the percentage of children 10 to 14 years of age attending school in each of the years 1910 and 1900 by geographic divisions:

divisions:	1910	1900
United States	88.2	79.8
New England	94.1	90.0
Middle Atlantic	92.9	85.7
East North Central	93.8	88.1
West North Central	93.6	88.3
	1910	1900
South Atlantic	78.7	65.6
East South Central	79.0	65.8
West South Central	80.5	68.3
Mountain	90.2	85.2
Pacific	94.1	91.8

In the Northern and Western divisions over nine-tenths of the children in these ages are enrolled in schools. In the three Southern divisions, the proportion approximates eight-tenths. A comparison of the two years shows an advance in all sections, but it is most marked in the Southern states, reflecting the great progress of popular education in those states in recent years.

The age of compulsory school attendance where it exists differs under the laws for different states. It generally begins when a child reaches 8 years of age and ceases when he reaches 14 years of age. The percentage of children in the ages 8 to 13 years, both inclusive, who attend school is undoubtedly higher than for the children 6 to 14 years, given in the table. The latter group comprises some children who have not begun and some who have finished their schooling.

Public High Schools and Private High Schools and Academies.

In the school year 1912 there were 11,224 public high schools and 2,044 private high schools. In the public high schools there were 22,923 male secondary teachers and 28,930 female secondary teachers; 489,048 male secondary students and 616,312 female secondary students.

In the private high schools there were 5,307 male teachers and 7,076 female teachers there were 66,742 male secondary studen and 74,725 female secondary students.

Public and Private Normal Schools.

In the school year 1912 there were 222 public normal schools having 1,487 male teachers and 2,577 female teachers. There were 17,725 male students and 65,749 female students. There were 55 private normal schools, having 144 male teachers and 257 female teachers, and 2,135 male students and 4,375 female students.

Universities, Colleges and Technological Schools.

In the school year there were 594 institutions of this class, having 24,476 male professors and instructors and 5,494 female professors and instructors. In the preparatory schools there were 40,154 male and 23,197 female students. In the collegiate department there were 117,856 male and 68,779 female students. The total receipts, exclusive of additions to endowment funds, was $89,527,484.

Undergraduate Students in Universities, Colleges and Schools of Technology.

Out of 594 institutions included under the above head, there were 144 colleges for men, having 37,633 undergraduate students. There were 109 colleges for women, having 21,423 undergraduate students. There were 341 co-educational institutions having 80,215 male and 47,353 female undergraduate students, making a total of 127,568.

Professional Schools.

In the school year 1912 the number of schools and students was as follows:

182 schools of theology served 11,242 students; 118 law schools had 20,760 students enrolled; 115 medical colleges had 18,451 students enrolled; 52 dental colleges had 7,190 students; 76 schools of pharmacy had 6,158 students; 21 schools of veterinary medicine had 2,282 students.

Schools for the Blind, Deaf and Feeble-Minded.

In the school year 1912 there were 60 State schools for the blind in the United States, having 4,992 pupils. There were 64 State schools for the deaf, having 11,244 pupils. In addition there were 58 public day schools for the deaf, having 1,928 pupils and 19 private schools, having 518 pupils. There were also 33 State institutions for the feeble-minded caring for 21,357 inmates, while 20 private institutions cared for 749 inmates.

REGISTRATION OF SPECIFIED UNIVERSITIES, NOV. 1, 1912.

[Data furnished by Rudolf Tombo, jr., alumni secretary Columbia University.]

Faculties.	California.	Chicago.	Columbia.	Cornell.	Harvard.	Illinois.	Iowa.	Johns Hopkins.	Kansas.	Michigan.	Minnesota.	Missouri.	Nebraska.	New York University.
College, men	914	879	819	1,051	2,306	454	529	197	642	1,550	633	774	464	413
College, women	1,425	720	590		483	348	494	.....	540	732	908	480	617	182
Agriculture	429	.....	.....	1,185	.....	732	.....	.....	.....	.....	396	454	328	.....
Architecture	116	.....	129	133	(1)	341	.....	.....	.....	(1)	(1)	.....	.....	.....
Art	.....	.....	.....	.....	.....	(1)	(1)	.....	24	(1)	(1)	.....	19	.....
Commerce	297	.....	.....	.....	107	206	(1)	.....	.....	(1)	.....	.....	.....	1,598
Dentistry	89	.....	.....	.....	192	.....	176	.....	.....	252	239	.....	.....	.....
Divinity	.....	132	.....	.....	48	.....	.....	.....	.....	.....	.....	.....	.....	.....
Forestry	(1)	.....	.....	.....	(1)	(1)	.....	.....	.....	(1)	(1)	.....	64	.....
Graduate school (non-professional)	382	490	1,399	296	532	256	131	207	84	206	63	112	164	315
Journalism	.....	.....	72	.....	.....	(1)	.....	.....	.....	(1)	.....	55	.....	(1)
Law	159	177	457	294	740	122	218	.....	184	654	237	121	222	693
Medicine	108	127	336	120	288	.....	113	351	79	298	180	56	159	408
Music	(1)	.....	20	.....	.....	79	.....	.....	118	(1)	(1)	.....	.....	.....
Pedagogy	(1)	266	1,606	.....	.....	(1)	(1)	.....	208	(1)	82	181	148	355
Pharmacy	87	.....	420	.....	.....	176	.....	.....	72	92	77	.....	32	.....
Scientific schools [2]	735	.....	634	1,419	132	965	168	.....	380	1,284	591	344	376	190
Veterinary medicine	(1)	.....	.....	120	.....	.....	.....	.....	.....	.....	.....	.....	.....	16
Other courses	.....	740	.....	.....	.....	269	.....	17	.....	.....	12	.....	.....	.....
Deduct double registration	*156*	*165*	*354*	*13*	.....	.....	*63*	.....	*219*	*145*	.....	*189*	*110*	*107*
Total, Nov. 1, 1912	4,585	3,366	6,148	4,605	4,828	3,948	1,766	772	2,112	4,923	3,418	2,388	2,483	4,063
Summer session, 1912	2,275	3,531	3,602	1,307	1,046	640	324	201	469	1,324	494	691	486	645
Deduct double registration	*408*	*546*	*748*	*500*	*145*	*275*	*146*	*29*	*178*	*627*	*175*	*208*	*158*	*165*
Grand total—														
Nov. 1, 1912	6,457	6,351	9,002	5,412	5,729	4,315	1,944	944	2,403	5,620	[4] 3,737	2,871	2,811	4,543
Nov. 1, 1911	5,724	6,062	7,938	5,609	5,426	4,929	1,967	1,120	2,265	5,452	4,548	2,780	.....	4,055
Nov. 1, 1910	4,552	5,883	7,411	5,169	5,329	4,659	1,957	890	2,246	5,339	4,972	2,678	.....	3,947
Nov. 1, 1909	3,968	5,487	6,132	5,028	5,558	4,502	2,246	792	2,144	5,258	4,351	2,589	.....	3,843
Nov. 1, 1908	3,644	5,114	5,677	4,700	5,342	4,400	2,356	707	2,086	5,188	4,607	2,558	.....	3,951
Nov. 1, 1903	3,477	4,146	4,557	3,438	6,013	3,239	1,260	694	1,319	3,926	3,550	1,540	.....	2,177
Extension and similar courses	[4] 894	3,031	2,959	.....	21	1,000	207	114	367	.....	1,326	305	.....	700
Officers	486	337	867	825	771	577	226	206	178	472	442	277	.....	381

Faculties.	Northwestern.	Ohio State.	Pennsylvania.	Pittsburgh.	Princeton.	Stanford.	Syracuse.	Texas.	Tulane.	Virginia.	Washington University.	Western Reserve.	Wisconsin.	Yale.
College, men	452	423	384	400	1,409	545	1,313	773	152	368	162	456	749	1,326
College, women	563	380	.....		.....	442		634	249	.....	217	354	727	.....
Agriculture	.....	720	.....	.....	.....	.....	37	41	.....	.....	.....	.....	802	.....
Architecture	.....	41	215	.....	.....	.....	55	55	15	.....	44	.....	.....	42
Art	.....	.....	.....	.....	.....	.....	175	.....	68	.....	.....	.....	.....	
Commerce	450	.....	636	.....	.....	.....	.....	.....	.....	.....	.....	.....	317	.....
Dentistry	478	.....	508	176	.....	.....	.....	.....	52	.....	101	127	.....	.....
Divinity	222	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
Forestry	.....	74	.....	.....	.....	.....	177	.....	.....	.....	.....	.....	.....	40
Graduate school (non-professional)	80	107	403	40	148	94	75	55	17	40	53	14	268	429
Journalism	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95	.....
Law	368	194	385	143	.....	136	240	318	87	226	76	130	160	133
Medicine	258	.....	313	136	.....	46	86	150	349	90	68	168	65	45
Music	452	.....	30	.....	.....	.....	855	.....	91	.....	.....	.....	60	92
Pedagogy	.....	129	.....	478	.....	.....	20	398	97	.....	.....	.....	54	.....
Pharmacy	193	85	.....	195	.....	.....	.....	61	12	.....	.....	111	15	.....
Scientific schools [2]	57	726	713	235	161	398	305	289	132	99	159	.....	728	1,139
Veterinary medicine	.....	155	115	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other courses	178	252	808	102	.....	.....	151	32	10	.....	78	50	5	.....
Deduct double registration	*152*	*12*	*220*	*72*	*150*	.....	*97*	*553*	*93*	*24*	.....	*32*	*88*	*80*
Total, Nov. 1, 1912	3,619	3,274	4,290	1,833	1,568	1,661	3,392	2,253	1,238	799	958	1,378	3,957	3,265
Summer session, 1912	78	600	751	.....	.....	50	257	927	1,116	(3)	.....	.....	1,741	.....
Deduct double registration	*65*	*266*	*198*	.....	.....	*41*	*120*	*164*	*105*	.....	.....	.....	*557*	.....
Grand total—														
Nov. 1, 1912	3,632	3,608	4,843	1,833	1,568	1,670	3,529	3,016	2,249	799	958	1,378	5,141	3,265
Nov. 1, 1911	3,438	3,567	5,220	.....	1,543	1,648	3,307	2,539	2,040	781	859	1,331	5,015	3,224
Nov. 1, 1910	3,543	3,181	5,187	.....	1,451	1,648	3,248	2,597	1,985	688	796	1,274	4,745	3,287
Nov. 1, 1909	3,197	3,012	4,857	.....	1,398	1,620	3,248	2,512	1,882	767	811	1,083	4,245	3,276
Nov. 1, 1908	3,113	2,700	4,555	.....	1,314	1,541	3,204	2,410	1,171	757	806	1,016	3,876	3,466
Nov. 1, 1903	2,740	1,688	2,644	.....	1,434	1,370	2,207	1,309	1,037	613	761	765	3,221	2,990
Extension and similar courses	.....	273	.....	451	.....	.....	.....	330	152	.....	207	Inc.	10,644	.....
Officers	437	274	549	271	223	278	265	226	313	100	184	212	595	431

[1] Included elsewhere.
[2] Includes schools of mines, engineering, chemistry, and related subjects.
[3] 1,285 students in attendance on summer courses.
[4] Exclusive of extension students, who were counted in previous years.

THE INTRACTABLE MISSOURI-MISSISSIPPI SYSTEM.

Training Schools for Nurses, Commercial Schools, Manual and Industrial Training Schools.

In the school year 1912 there were 1,054 training schools for nurses, having 32,346 students. There were also 519 commercial schools, having 137,790 students; 295 manual training schools with 61,543 students; 117 reform schools took care of 51,967 of the wayward.

Insane in Institutions.

The number of insane persons in institutions in the United States in 1910 was 187,791 of which number 60,769 were committed during the year. Those discharged numbered 29,304; 18,924 died during the year. The number of persons committed to hospitals for the insane per 100,000 of population for the year 1910 was 66.1 and the total number of insane persons in institutions per 100,000 population was 204.2.

According to the latest figures the University of Paris is the largest university in the world with 17,512 students, after which follows Berlin with 14,543; Moscow with 10,399; Cairo, 10,000; St. Petersburg, 9,886; Vienna, 8,457; Munich, 7,596; Budapest, 7,548; Naples, 6,600; Leipzig, 5,804; Madrid, 5,675. Asiatic universities are not considered. Columbia, the largest university in the United States, has 9,002; California, 6,457, and Chicago, 6,351.

CHAPTER II.

FARMS, FOODS AND FORESTS.

FARMS, FARM LAND, AND FARM PROPERTY OF THE UNITED STATES.

	1910 (April 15)	1900 (June 1)	INCREASE.[1]	
			Amount.	Per cent.
Population	91,972,266	75,994,575	15,977,691	21.0
Urban population [2]	42,623,383	31,609,645	11,013,738	34.8
Rural population [3]	49,348,883	44,384,930	4,963,953	11.2
Number of all farms	6,361,502	5,737,372	624,130	10.9
Land area of the country ... acres	1,903,289,600	1,903,461,760	−172,160	....
Land in farms ... acres	878,798,325	838,591,774	40,206,551	4.8
Improved land in farms ... acres	478,451,750	414,498,487	63,953,263	15.4
Average acreage per farm	138.1	146.2	−8.1	−5.5
Average improved acreage per farm	75.2	72.2	3.0	4.2
Per cent of total land area in farms	46.2	44.1	....	....
Per cent of land in farms improved	54.4	49.4	....	....
Per cent of total land area improved	25.1	21.8	....	....
Value of farm property, total	$40,991,449,090	$20,439,901,164	$20,551,547,926	100.5
Land	28,475,674,169	13,058,007,995	15,417,666,174	118.1
Buildings	6,325,451,528	3,556,639,496	2,768,812,032	77.8
Implements and machinery	1,265,149,783	749,775,970	515,373,813	68.7
Domestic animals, poultry, and bees	4,925,173,610	3,075,477,703	1,849,695,907	60.1
Average value of all property per farm	$6,444	$3,563	$2,881	80.9
Average value of all property per acre of land in farms	46.64	24.37	22.27	91.4
Average value of land per acre	32.40	15.57	16.83	108.1

[1] A minus sign (—) denotes decrease.
[2] Population of incorporated places having, in 1910, 2,500 or more inhabitants. The figure for 1900 does not represent the urban population according to that census but is the population in that year of the territory classified as urban in 1910.
[3] Total, exclusive of urban.

NUMBER AND ACREAGE OF FARMS AND NUMBER OF ACRES IMPROVED AND UNIMPROVED.

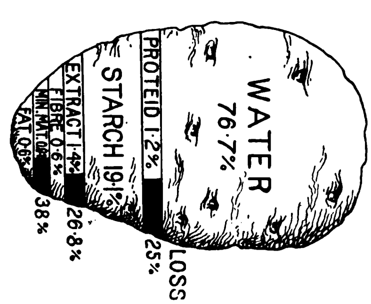
[Source: Reports of the Bureau of the Census, Department of Commerce and Labor.]

Census year.	Number of farms.	Number of acres in farms.				Per cent of farm land—	
		Improved.	Unimproved.	Total.	Average number of acres to a farm.	Improved.	Unimproved.
1850	1,449,073	113,032,614	180,528,000	293,560,614	202.6	38.5	61.5
1860	2,044,077	163,110,720	244,101,818	407,212,538	199.2	40.1	59.9
1870 [1]	2,659,985	188,921,099	218,813,942	407,735,041	153.3	46.3	53.7
1880 [1]	4,008,907	284,771,042	251,310,793	536,081,835	133.7	53.1	46.9
1890 [1]	4,564,641	357,616,755	265,601,864	623,218,619	136.5	57.4	42.6
1900 [2]	5,737,372	414,498,487	424,093,287	838,591,774	146.2	49.4	50.6
1910 [3]	6,361,502	478,451,750	400,346,575	878,798,325	138.1	54.4	45.6

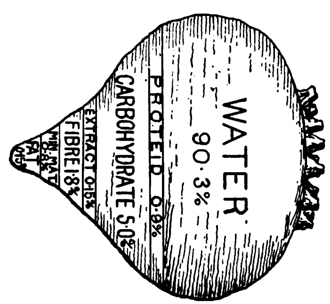
[1] Not including farms of less than 3 acres which reported the sale of less than $500 worth of products in the census year.
[2] Exclusive of Alaska and Hawaii.
[3] Exclusive of Alaska, Hawaii, and Porto Rico.

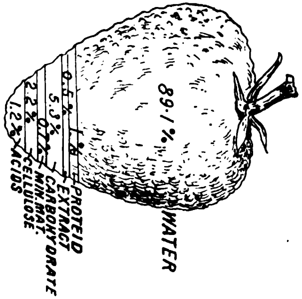
FARMS, FARM LAND, AND FARM PROPERTY OF THE UNITED STATES: 1850 TO 1910.

	1910	1900	1890	1880	1870	1860	1850
Population	91,972,266	75,994,575	62,947,714	50,155,783	38,558,371	31,443,321	23,191,876
Number of all farms	6,361,502	5,737,372	4,564,641	4,008,907	2,659,985	2,044,077	1,449,073
Land area of the country ... acres	1,903,289,600	1,903,461,760	1,903,337,600	1,903,337,600	1,903,337,600	1,903,337,600	1,884,375,680
Land in farms ... acres	878,798,325	838,591,774	623,218,619	536,081,835	407,735,041	407,212,538	293,560,614
Improved land in farms ... acres	478,451,750	414,498,487	357,616,755	284,771,042	188,921,099	163,110,720	113,032,614
Average acreage per farm	138.1	146.2	136.5	133.7	153.3	199.2	202.6
Average improved acreage per farm	75.2	72.2	78.3	71.0	71.0	79.8	78.0
Per cent of total land area in farms	46.2	44.1	32.7	28.2	21.4	21.4	15.6
Per cent of land in farms improved	54.4	49.4	57.4	53.1	46.3	40.1	38.5
Per cent of total land area improved	25.1	21.8	18.8	15.0	9.9	8.6	6.0
Value of farm property, total	$40,991,449,090	$20,439,901,164	$16,082,267,689	$12,180,501,538	$8,944,857,749	$7,980,493,063	$3,967,343,580
Land and buildings	34,801,125,697	16,614,647,491	13,279,252,649	10,197,096,776	7,444,054,462	6,645,045,007	3,271,575,426
Implements and machinery	1,265,149,783	749,775,970	494,247,467	406,520,055	270,913,678	246,118,141	151,587,638
Domestic animals, poultry, and bees	4,925,173,610	3,075,477,703	2,308,767,573	1,576,884,707	1,229,889,609	1,089,329,915	544,180,516
Average value of all property per farm	$6,444	$3,563	$3,523	$3,038	$3,363	$3,904	$2,738
Average value of all property per acre of land in farms	46.64	24.37	25.81	22.72	21.94	19.60	13.51
Average value of land and buildings per acre	39.60	19.81	21.31	19.02	18.26	16.32	11.14



Loss of Constituents on Boiling.



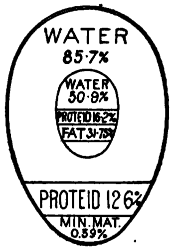


PERCENTAGE COMPOSITION OF A POTATO, TURNIP AND STRAWBERRY.

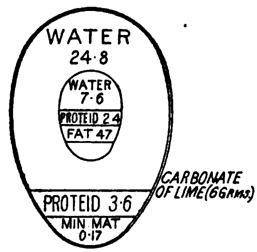
WEALTH PRODUCTION ON FARMS.

[Source: Reports of the Department of Agriculture.]

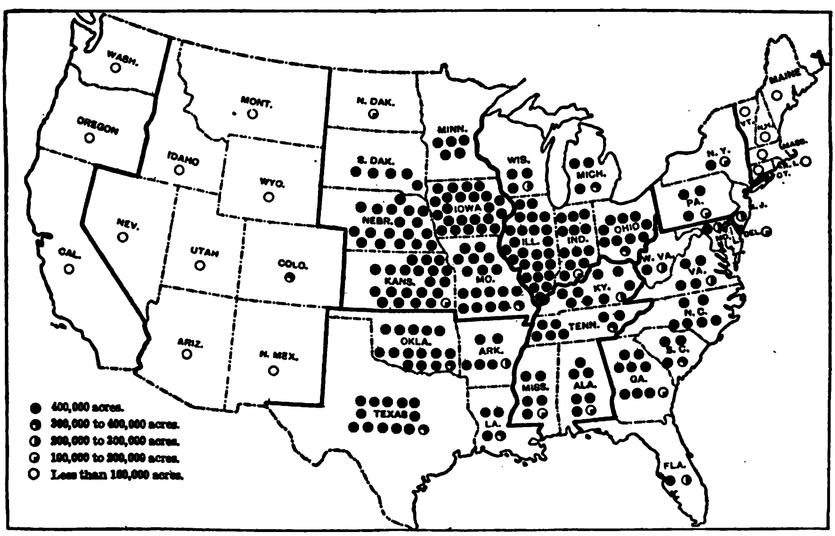
Calendar year.	Wealth production.	Calendar year.	Wealth production.
	Dollars.		*Dollars.*
1899	4,717,000,000	1906	6,764,000,000
1900	5,017,000,000	1907	7,488,000,000
1901	5,317,000,000	1908	7,891,000,000
1902	5,617,000,000	1909	8,498,000,000
1903	5,887,000,000	1910	9,037,000,000
1904	6,122,000,000	1911	8,819,000,000
1905	6,274,000,000	1912	9,299,000,000



PERCENTAGE COMPOSITION OF WHITE AND YOLK OF EGG.



ACTUAL COMPOSITION OF EGG.—WEIGHT 50 GMS.

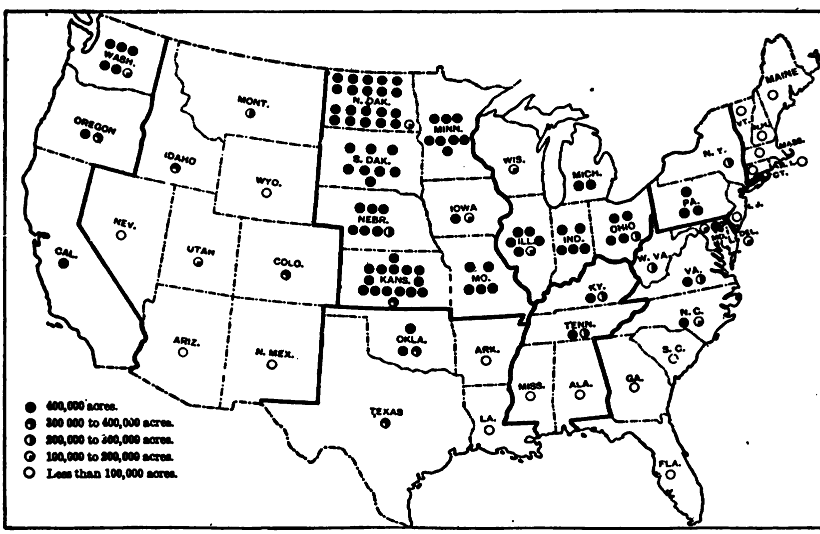


CORN: ACREAGE BY STATES, 1909.

CEREAL CROPS: ESTIMATED PRODUCTION AND VALUE.

Commodity	Total.			Average.		
	Area.	Production.	Farm Value Dec. 1.	Farm Value per bushel Dec. 1.	Yield per acre.	Farm Value of yield per acre.
	Acres.	Bushels.	Dollars.	Cents.	Bshls.	Dollars.
Corn:						
1866-75[1]..	32,715,700	969,947,600	454,534,800	47.8	26.1	12.48
1912.....	107,083,000	3,124,746,000	1,520,454,000	48.7	29.2	14.20
Wheat:						
1866-75[1]..	20,470,300	244,672,300	257,586,800	108.6	11.9	12.92
1912.....	45,814,000	730,267,000	555,280,000	76.0	15.9	12.12
Oats:						
1866-75[1]..	9,746,000	272,992,800	102,422,700	37.8	28.1	10.62
1912.....	37,917,000	1,418,337,000	452,469,000	31.9	37.4	11.93
Rye:						
1866-75[1]..	1,346,800	18,266,600	14,559,000	78.1	13.6	10.62
1912.....	2,117,000	35,664,000	23,636,000	66.3	16.8	11.16
Barley:						
1866-75[1]..	1,196,500	26,992,300	21,382,200	79.0	22.9	18.09
1912.....	7,530,000	223,824,000	112,957,000	50.5	29.7	15.00
Buckwheat:						
1866-75[1]..	729,900	13,368,800	9,735,200	72.5	18.3	13.27
1912.....	841,000	19,249,000	12,720,000	66.1	22.9	15.12

[1]Average per year for the period.
Statistical Abstract of the U. S.—Report of the Department of Agriculture.



WHEAT: ACREAGE BY STATES, 1909.

THE ENORMOUS CROPS OF 1909.

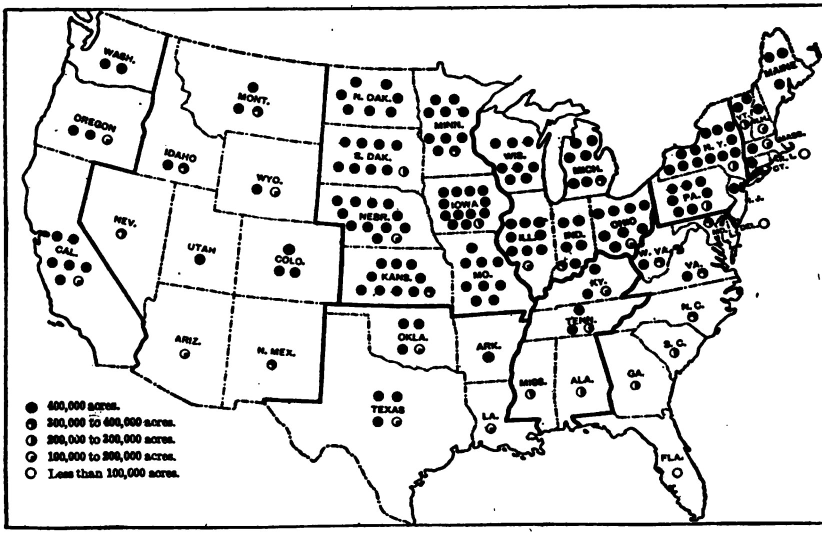
If piled up in Madison Square the crops of this year would completely swamp the Metropolitan tower.

OVER HALF THE CEREAL ACREAGE IN CORN.

In the United States as a whole a little more than one-half of the acreage devoted to cereals is in corn, a little less than one-fourth in wheat, and slightly less than one-sixth in oats. In each of the nine divisions, except the Pacific, the three leading cereals—corn, wheat, and oats—occupy, as in the United States at large, much more than three-fourths of the total cereal acreage. In the Pacific states the acreage of corn is insignificant, and that of barley exceeds that of oats. Corn occupies the leading place in the important cereal-producing regions, but in the New England and Middle Atlantic divisions the first place is held by oats, and in the Pacific and Mountain divisions by wheat.

HAY CROP. ESTIMATED ACREAGE, PRODUCTION, AND VALUE, 1912.

For the year 1912 the production of hay in the United States was 72,691,000 short tons, and the total acreage of land in hay was 49,530,000. The total farm value of the United States on December 1, 1912, was $856,695,000. The average price of hay per short ton on December 1, 1912 was $11.79, and the average yield per acre for the year was 1.47 short tons. The average farm value of yield per acre on December 1, 1912 was $17.30.



HAY AND FORAGE CROPS, 1909.

INITIATIVE AND REFERENDUM.

The "initiative" is a political device by which the people are enabled to pass laws or ordinances without change or modification by the ordinary legislative bodies. It has been called the positive or constructive side of direct legislation, just as the referendum, which enables the people to reject proposed laws, is the negative side. By this method a minority ranging in number from 5 to 25 per cent. may file a petition for a law, or, when a city, an ordinance. The measure must then, without change or revision, go before the people for their judgment, and, if it is approved by a majority of the votes cast, it becomes law without further process. Laws and ordinances so passed are not subject to veto.

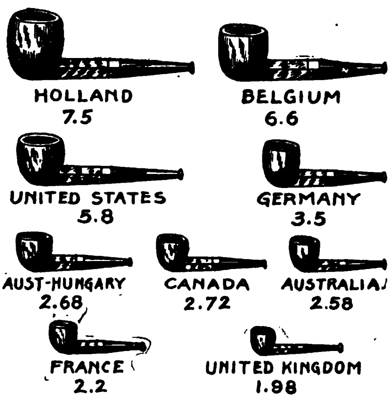
The "referendum" may be defined as the submission of a proposed law, or ordinance, which has been passed by the people's representative in a legislature or council, to a vote of the people for ratification or rejection. It has been in use in a restricted form, in the United States for many years, especially in passing upon constitutions and constitutional amendments. It is only since 1898, however, that the referendum, in connection with the initiative, has been used as an instrument of direct legislation both by states and cities. The states which have adopted the initiative and referendum are Arkansas, California, Colorado, Illinois, Maine, Missouri, Montana, Oklahoma, Oregon, South Dakota and Utah. Nevada has adopted the referendum only.

THE RECALL.

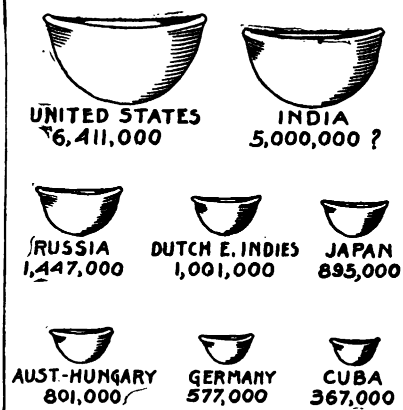
The "recall" is a method of procedure by which the people are enabled to remove from his position any public elective official at will. This requires a petition signed by a certain specified percentage or number of voters. The usual percentage in such cases is 25. In most cities under the commission form of government the recall of elective public officers is provided for through the filing of petitions signed by from 15 to 75 per cent. of the voters. In South Dakota cities the percentage is only 15, while in Illinois it is 55, and 33 in Louisiana. In Oregon all state officials, including judges and members of the legislature, are subject to the recall.—*Chicago Daily News Almanac*, 1912.

TOBACCO CROP IN CONTINENTAL UNITED STATES: 1912.

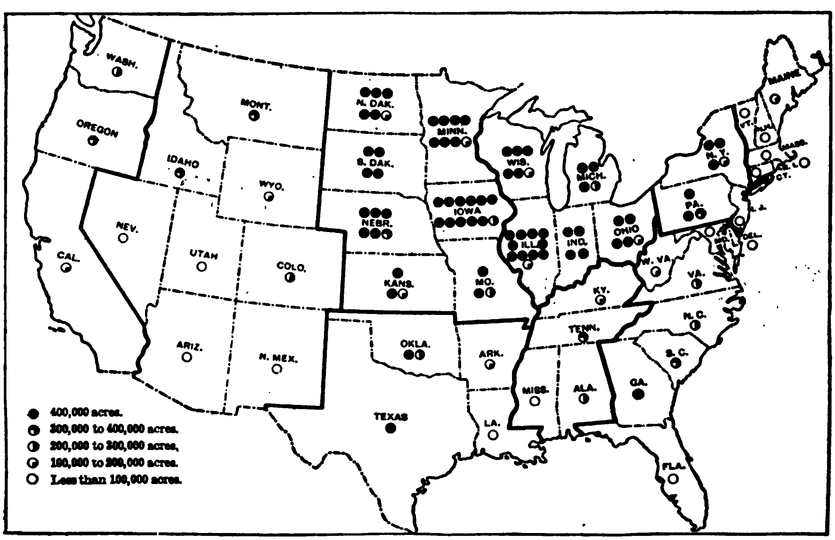
For the year 1912 there were 1,225,800 acres of land planted in tobacco, and the total product derived therefrom amounted to 962,855,000 pounds. The value of this product was estimated at $104,603,000. Kentucky ranked first in the tobacco producing states of the Union, Virginia second, then followed, in their respective order, North Carolina, Ohio, Tennessee, Pennsylvania, Wisconsin, Connecticut, South Carolina, Maryland, Indiana, West Virginia, Massachusetts, Missouri, New York, and Illinois.



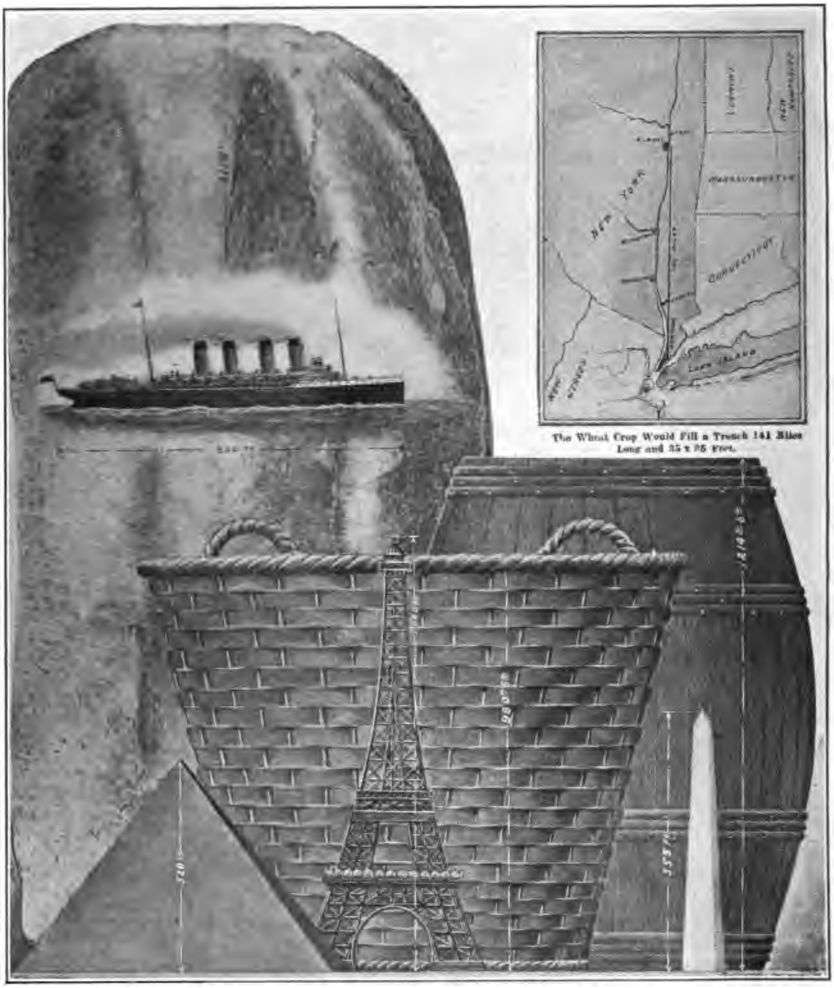
A YEAR'S CONSUMPTION OF TOBACCO
(in pounds per head)



A YEAR'S CROP OF TOBACCO
(per cwt., 112 pounds)



OATS: ACREAGE BY STATES, 1909.



WHAT OUR WHEAT CROP MEANS.

The 735,260,970-bushel wheat crop of 1906 converted into a 1,214-foot barrel of flour, and baked into an immense loaf, 2,158 feet high.

WOOL PRODUCTION: 1912.

On April 1, 1912 the total number of sheep of shearing age was 38,481,000 and the average weight of a fleece for the year was 6.82 pounds. The per cent. of shrinkage for the same year was 59.3. There were 304,043,400 pounds of wool washed and unwashed, and 136,866,652 pounds of scoured wool. The average value per pound of scoured wool for the year 1912 was 47.7 cents, and the total value of all the scoured wool to October 1, 1912 (Boston Market) was $75,819,251.

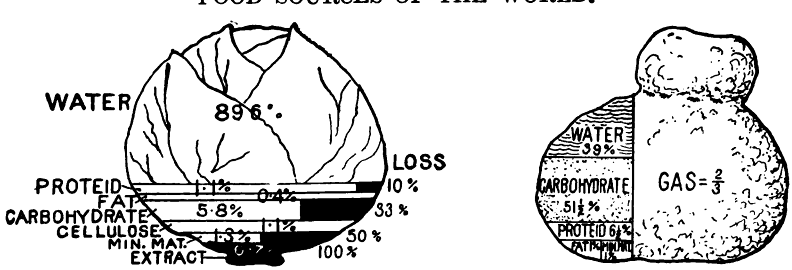
POTATO CROP: 1912

For the year 1912 the total 3,711,000 acres planted to potatoes in the United States produced a total of 428,647,000 bushels of potatoes. Their total farm value on December 1, 1912 was $212,550,000, making the average value per bushel 50.5 cents. The average yield per acre for the whole United States was 113.4 bushels and the average farm value of yield per acre on December 1 was $57.28.

SUGAR BEETS: 1911.

During the year 1911 there were 66 sugar beet factories in operation. For the same period there were 473,877 acres of sugar beets harvested, and the average yield per acre was 10.68 short tons. The factories of the United States worked 5,062,333 short tons of beets and produced 1,199,000,000 pounds, or 599,500 short tons of sugar. For the same period there were 723,840,000 pounds of cane sugar produced and 34,120,000 gallons of molasses.

FOOD SOURCES OF THE WORLD.



Loss of Constituents on Boiling.

PERCENTAGE COMPOSITION OF CABBAGE AND BREAD.

COTTON PRODUCTION AND STATISTICS: 1912.

According to the revised estimates of the Department of Agriculture, the area planted in cotton in 1912 was 34,766,000 acres, of which 483,000 acres, or 1.4 per cent. were abandoned, leaving 34,283,000 acres as the area from which the crop was harvested. This is a reduction of 1,762,000 acres as compared with 1911. This total of 34,283,000 acres was divided among the several states as follows: Texas, 11,338,000 acres; Georgia, 5,335,000; Alabama, 3,730,000; Mississippi, 2,889,000; South Carolina, 2,695,000; Oklahoma, 2,665,000; Arkansas, 1,901,000; North Carolina, 1,545,000; Louisiana, 929,000; Tennessee, 783,000; Florida, 224,000; Missouri, 103,000; Virginia, 47,000 and California, 9,000 acres.

The average production of lint per acre in 1912 was 191 pounds, as compared with 208 pounds in 1911 and 171 pounds in 1910. The average yield per acre in North Carolina was 267 pounds; Missouri 260, Virginia 250, South Carolina 209, and in Texas 206 pounds. No other state had an average as high as 200 pounds.

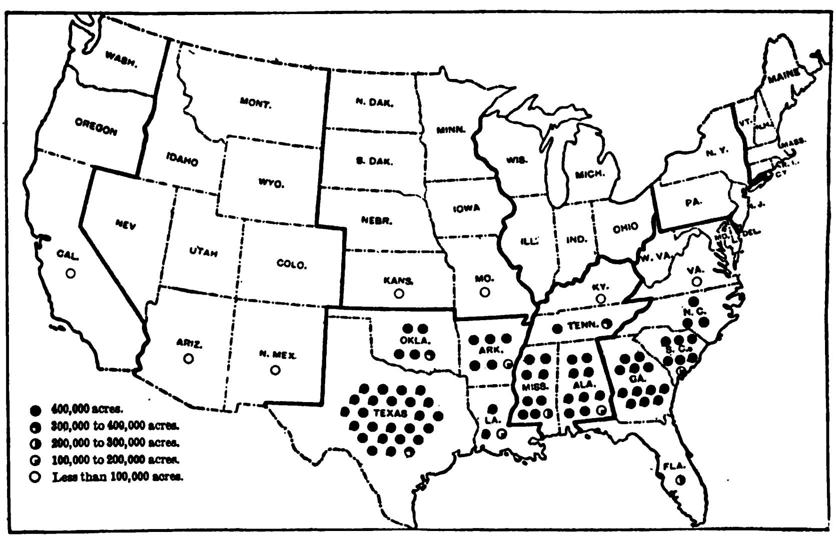
The production of cotton in the most important states during 1912 was as follows: Texas, 4,888,623 bales (round bales counted as half bales); Georgia, 1,888,963; Alabama, 1,367,136; South Carolina, 1,259,762; Oklahoma, 1,057,125; Mississippi, 1,049,604; all other states, 2,579,650 bales, or a total for the United States of 14,090,863 bales. The aggregate value of this cotton crop for 1912 was $920,630,000.

The total number of ginneries in 1912 was 28,358, of which number 25,279 were active and 3,079 were idle. The average number of running bales ginned per establishment was 535.

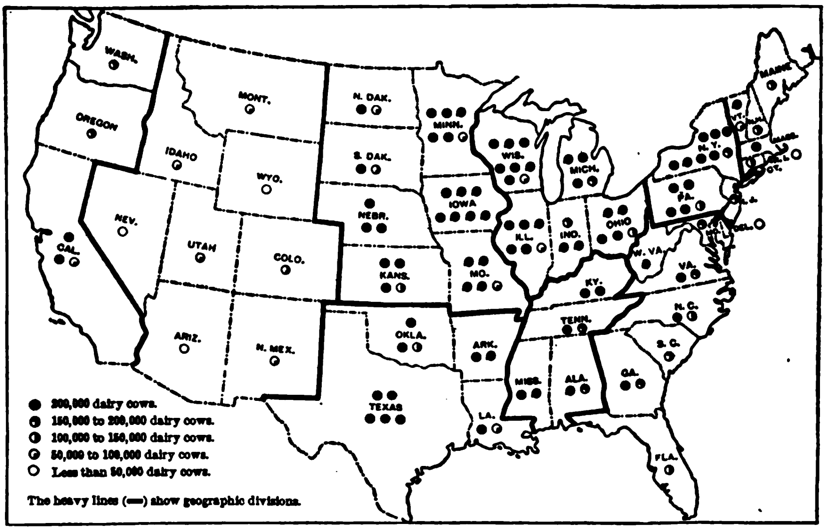
The World's production of cotton for mill consumption, by countries for the year 1912 was as follows: United States, 13,696,000 bales, or 62.8 per cent of the world's production; India, 3,518,000 bales; Egypt, 1,523,000 bales; China, 1,074,000 bales; Russia, 950,000 bales; Brazil, 320,000 bales; all other countries 736,000 bales, making the total for the year 21,817,000 bales.

On March 1, 1913 there were in the United States 30,575,028 active cotton spindles, 11,853,142 of which were in cotton producing states and the remainder in other states. The number of spindles in the principal countries of the world on March 1, 1913 was as follows: Great Britain, 55,576,108; Germany, 10,920,426; Russia, 8,950,000; France, 7,400,000; Austria, 4,864,453; Italy, 4,580,000; Spain, 2,200,000; Switzerland, 1,398,062; India, 6,400,000; Japan, 2,250,000.

The imports of cotton, for the seven months, Sept. 1912 to March 1913, amounted to 167,749 bales; of this amount 143,710 bales were imported from Egypt and 11,989 bales from China. The exports for the same period amounted to 7,175,601 bales; of this amount 2,979,601 were exported to the United Kingdom; 1,970,519 bales to Germany, 911,100 bales to France; 351,487 bales to Italy and 963,363 bales to all other countries.



COTTON: ACREAGE BY STATES, 1909.



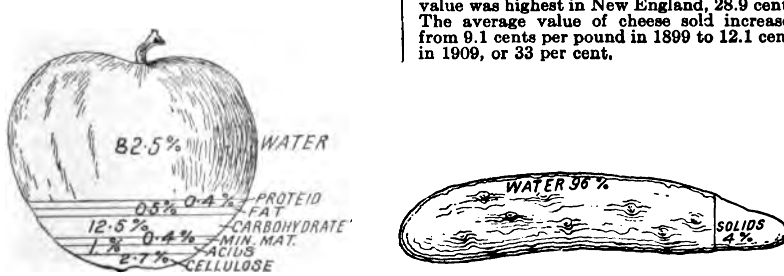
DAIRY COWS ON FARMS: NUMBER BY STATES, 1910.

MILK, BUTTER AND CHEESE.

The total quantity of milk reported as produced on farms in 1909 was 5,813,699,474 gallons. During the same year, there were 994,650,610 pounds of butter, having a value of $222,861,440, made on farms and 624,764,653 pounds, having a value of $170,510,619, made in factories; thus the total quantity of butter made during the year was 1,619,415,263 pounds, valued at $402,372,059. The cheese made on farms amounted to 9,405,864 pounds, valued at $1,148,708 and that made in factories amounted to 311,126,317, valued at $43,239,924; thus the total production for the year was 320,532,181 pounds, having a value of $44,388,632.

The total reported value of dairy products sold on farms in 1909 was $437,769,412 and was made up as follows: Milk sold, 1,937,255,864 gallons, valued at $252,436,757; cream, 54,933,583 gallons, value $37,655,047; butter fat, 305,662,587 pounds, value $82,311,511; butter, 415,080,489 pounds, value 100,378,123 cheese, 8,136,901 pounds, value $987,974. The quantity of milk sold as such was reported as 1,937,255,864 gallons, or about one-third of the total production. However, it should be borne in mind that a great deal of milk sold or delivered to creameries for butter making is paid for on the basis of the cream or butter fat content, in which case the quantity of such cream or butter fat is reported, and not the quantity of milk. The greater part of milk reported as sold was doubtless consumed as such in the cities and villages.

The average value of butter sold by farmers in the United States was 24.2 cents per pound in 1909, as compared with 16.7 cents in 1899, an increase of 44.9 per cent. The average value was highest in New England, 28.9 cents. The average value of cheese sold increased from 9.1 cents per pound in 1899 to 12.1 cents in 1909, or 33 per cent.



PERCENTAGE COMPOSITION OF APPLE AND CUCUMBER.

FATHER KNICKERBOCKER'S DAILY FARE.

Oleomargarine.

During the year 1912 a total quantity of 126,251,147 pounds of oleomargarine was produced in the United States. The internal revenue tax paid for this total production was $623,427.49; 3,259,483 pounds were taxed at the rate of ten cents a pound and 122,991,664 pounds at one-fourth of a cent per pound.

Cottonseed Products: Production and Manufacture, 1911.

During the year 1911 there were 6,997,000 short tons of cottonseed produced in the United States and of this amount 4,921,073 short tons were manufactured. The average value per ton of cottonseed used for manufacturing purposes was $18.30 per short ton. The cottonseed products having a value of $131,340,000 were as follows: Oil, 201,650,000 gallons with a value of $66,580,000; cake and meal, 2,151,000 short tons with a value of $49,720,000; hulls, 1,642,000 short tons with a value of $9,890,000; linters, 533,098 bales of 500 pounds net, value $5,150,000.

Flaxseed Crop: 1912.

In 1912, the 2,851,000 acres planted to flaxseed produced a crop of 28,073,000 bushels. The total farm value on December 1 was $32,202,000, thus making the average price paid per bushel $1.147. The average yield per acre amounted to 9.8 bushels. The average farm value of yield per acre was $11.29.

Bees.

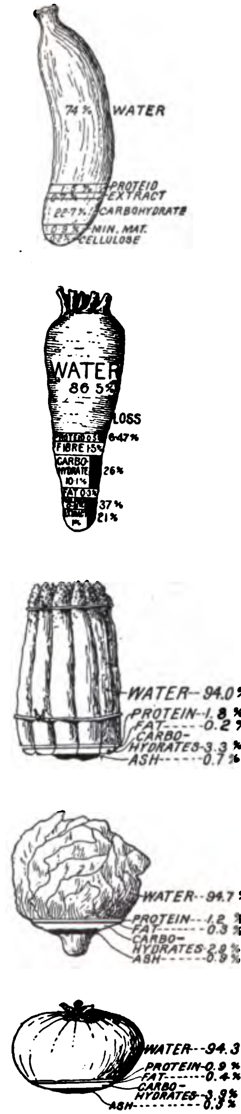
According to the Census report for 1910 there were in the United States 3,445,006 colonies of bees, with a value of $10,373,615, or an average of $3.01 per colony. Nine and two-tenths per cent., or 585,955 farms in the United States, reported bee colonies.

Florist and Nursery Products.

In 1909 there were 10,614 florist establishments reporting products valued at $34,872,000.

The total value of nursery products reported from 5,582 establishments in 1909 was $21,051,000.

COMPARISON OF FARM ANIMALS IN THE UNITED STATES.



PERCENTAGE COMPOSITION OF BANANA, CARROT, ASPARAGUS, LETTUCE AND TOMATO.

NUMBER AND VALUE OF FARM ANIMALS, 1910.

	All cattle (including calves).	Dairy cows.	Other cows.	Heifers.	Steers and bulls.
1910—Number	[1] 61,803,866	20,625,432	12,023,682	7,295,890	13,048,547
Value	[1] $1,499,523,607	$706,236,307	$269,160,193	$103,194,026	$347,901,174
Average value	$24.26	$34.24	$22.39	$14.14	$26.66
Farms reporting	5,284,916	5,140,869	1,444,733	2,374,507	....
Per cent of all farms	83.1	80.8	22.7	37.3	....
1900—Number	67,719,410	17,135,633	11,559,194	7,174,483	16,534,518
Value	$1,475,204,633	$508,616,501	$271,302,682	$121,528,076	$436,467,373
Average value	$21.78	$29.68	$23.47	$16.94	$26.40

[1] Includes 1,003,786 unclassified cattle, valued at $21,031,774.

	SHEEP.[1] All sheep and lambs.	Ewes.	Rams and wethers.	Lambs.	All goats and kids.
1910—Number	52,447,861	31,933,797	7,710,249	12,803,815	2,915,125
Value	$232,841,585	$164,855,314	$38,660,830	$29,325,441	$6,176,423
Average value	$4.44	$5.16	$5.01	$2.29	$2.12
Farms reporting	610,894	590,878	297,138	470,626	82,755
Per cent of all farms	9.6	9.3	4.7	7.4	1.3
1900—Number	61,503,713	31,857,652	7,995,315	21,650,746	1,870,599
Value	$170,203,119	$101,288,730	$26,898,061	$42,016,328	$3,265,349
Average value	$2.77	$3.18	$3.36	$1.94	$1.75

[1] For definition of the subclasses at the two censuses, see preceding table.

	All horses, mules, and asses and burros.	Horses.	Mules.	Asses and burros.
1910—Number	24,148,580	19,833,113	4,209,769	105,698
Value	$2,622,180,170	$2,083,588,195	$525,391,863	$13,200,112
Average value	$108.59	$105.06	$124.80	$124.89
Farms reporting	....	4,692,814	1,869,005	43,927
Per cent of all farms	....	73.8	29.4	0.7
1900—Number	21,625,800	18,267,020	3,264,615	94,165
Value	$1,098,546,454	$896,513,217	$196,222,053	$5,811,184
Average value	$50.80	$49.08	$60.11	$61.71
Farms reporting	....	4,530,628	1,480,652	33,584
Per cent of all farms	....	79.0	25.8	0.6

	All swine.	Hogs and pigs born before Jan. 1.	Pigs born after Jan. 1.
1910—Number (April 15)	58,185,676	35,134,097	23,051,579
Value	$399,338,308	$352,157,958	$47,180,350
Average value	$6.86	$10.02	$2.05
Farms reporting	4,351,751	4,092,391	1,868,672
Per cent of all farms	68.4	64.3	29.4
1900—Number (June 1)	62,868,041	(1)	(1)
Value	$231,978,031	(1)	(1)
Average value	$3.69	(1)	(1)
Farms reporting	4,335,363	(1)	(1)
Per cent of all farms	75.6	(1)	(1)

[1] No age classification in 1900.

HOMICIDES.

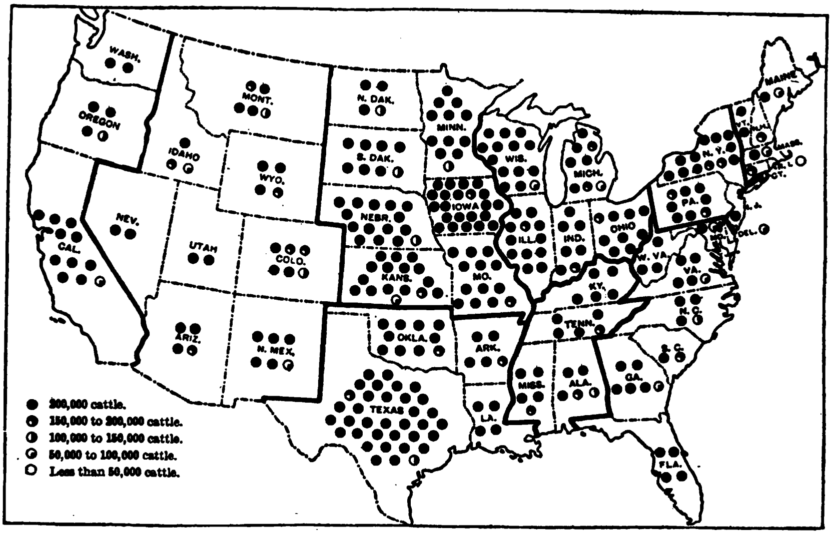
The number of deaths by personal violence in 1912 was 9,152, as compared with 8,272 in 1911 and 8,975 in 1910. The various causes were as follows:

Quarrels	4,380	Infanticide	158
Unnamed	2,021	Resisting arrest	171
Liquor	963	Insanity	118
By highwaymen	367	Riots	25
Jealousy	903	Self defense	89
Highwaymen killed	70	Strikes	43
		Criminal outrages	22

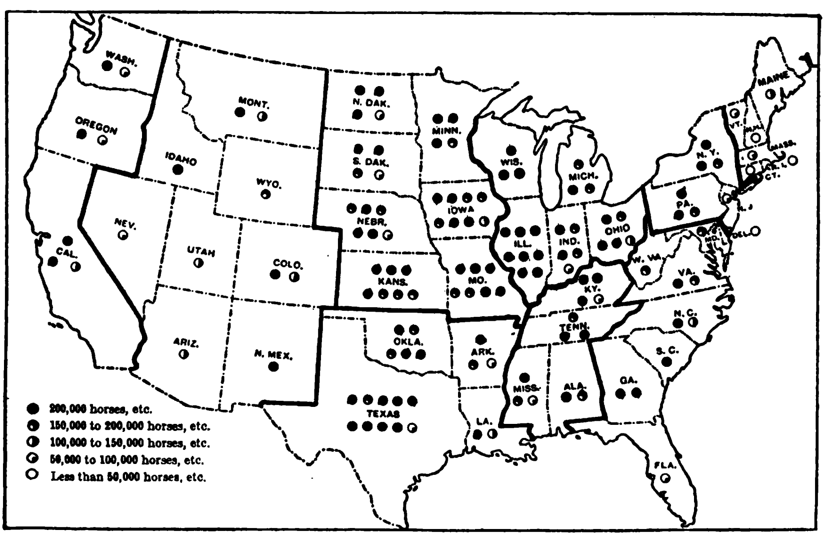
LYNCHINGS.

The number of lynchings in 1912 shows a decrease, being 67, as compared with 71 in 1911. The following table shows the number of lynchings during the past 28 years. Over 95% of the lynchings occur in the southern states.

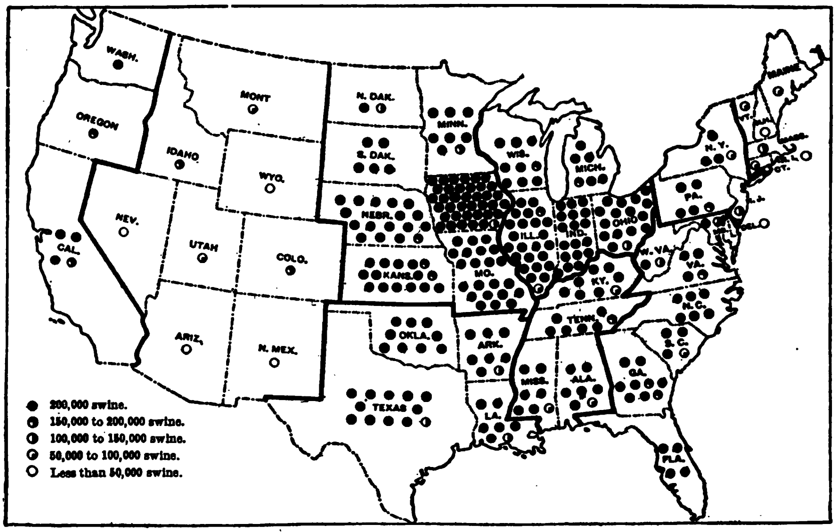
1885	184	1888	142	1891	192	1902	96
1886	138	1889	176	1892	255	1903	104
1887	122	1890	127	1893	200	1904	87
				1894	190	1905	66
				1895	171	1906	60
				1896	131	1907	63
				1897	100	1908	100
				1898	127	1909	87
				1899	107	1910	74
				1900	115	1911	71
				1901	135	1912	67



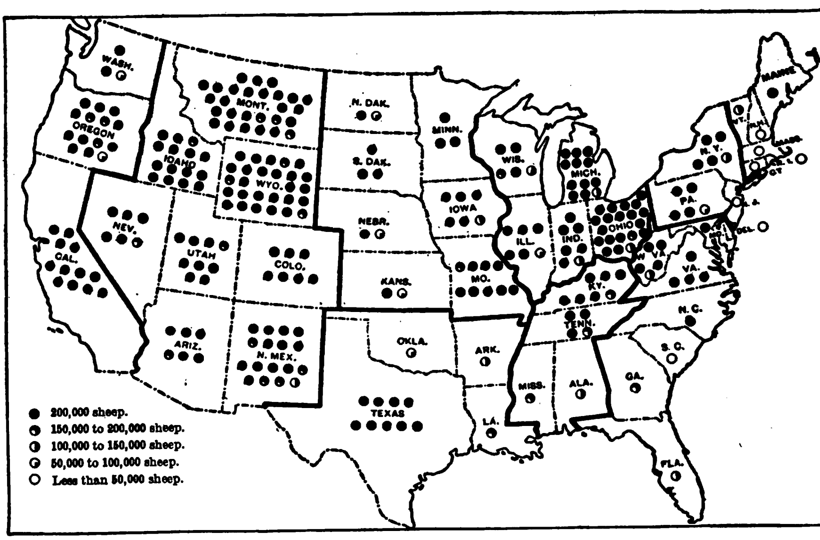
ALL CATTLE ON FARMS: NUMBER BY STATES, 1910.



ALL HORSES, MULES AND ASSES AND BURROS ON FARMS: NUMBER BY STATES, 1910.



ALL SWINE ON FARMS: NUMBER BY STATES, 1910.

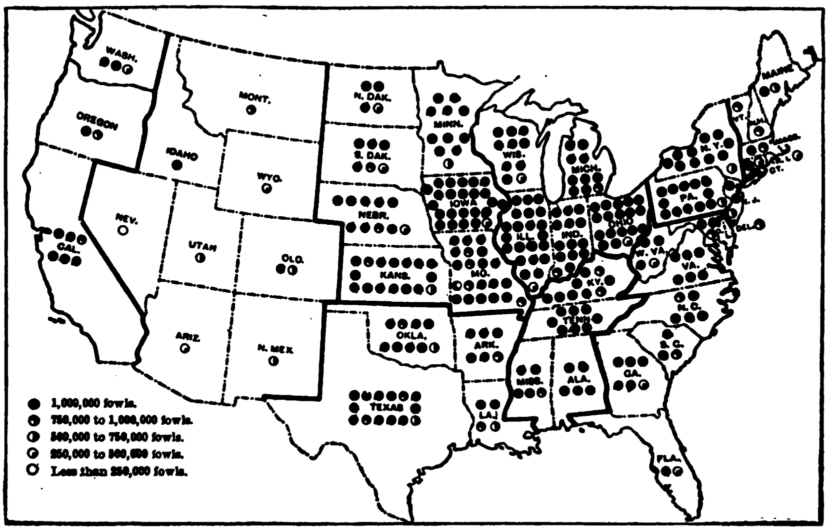


ALL SHEEP ON FARMS: NUMBER BY STATES, 1910.

NUMBER AND VALUE OF POULTRY IN THE UNITED STATES, 1910.

KIND.	1910 (Apr. 15). Farms reporting. Number.	1910 (Apr. 15). Farms reporting. Per cent of all farms.	1910 (Apr. 15). Number of fowls.	1910 (Apr. 15). Value.	1900 (June 1). Number of fowls.
Total	5,585,012	88.1	295,876,176	$153,394,142	250,623,354
Chickens	5,577,218	88.0	280,340,643	140,192,912	233,566,021
Turkeys	852,679	13.4	3,688,688	6,605,640	6,594,695
Ducks	503,673	7.9	2,904,359	1,566,176	4,785,850
Geese	661,189	10.4	4,431,623	3,192,861	5,676,788
Guinea fowls	339,922	5.4	1,765,033	613,282	(1)
Pigeons	99,409	1.6	2,730,996	762,372	(2)
All other[3]	2,005	(3)	14,834	460,899	(2)

[1] Included with chickens. [2] Not reported. [3] Less than one-tenth of 1 per cent.



ALL FOWLS ON FARMS: NUMBER BY STATES, 1910.

Rice Crop, 1912.

For the year 1912 the total 722,800 acres planted to rice in the United States produced a total of 25,054,000 bushels of rice. The total farm value on December 1, 1912 was $23,423,000 making the average price per bushel 93.5 cents. The average yield per acre was 34.7 for whole of the United States.

Hops: 1911.

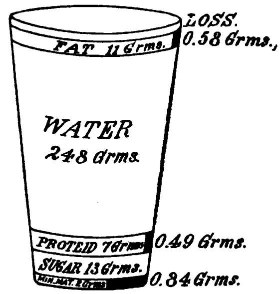
The total production of hops in the United States in 1911 amounted to 40,000,000 lbs., as against 44,000,000 lbs. in 1910, or 27.2 per cent. of the world's production. During 1910, the exports amounted to 12,748,617 lbs. and the imports to 5,823,520.

Egg Statistics.

According to a recent report of the Census Bureau, the production of eggs on farms of the United States in 1909 was 1,591 million dozen, valued at $306,689,000, equivalent to 19.3 cents per dozen. This production is equivalent to 207 eggs per capita of population. As less than 1 per cent. of the eggs produced are exported and almost none imported, production may be regarded as equivalent to domestic consumption. In the fiscal year ending June 30, 1910, the exports of eggs were 5,326,000 dozen and imports 818,000 dozen. A small proportion of the production is used for manufacturing purposes. The census report does not include the production of eggs in cities, towns, or villages. According to an estimate given in the census report of 1900, the production of eggs off farms was equal to about 5 per cent. of the production on farms; on this basis, about 80 million dozen eggs would have been produced off farms in 1909.

According to the census figures the production of eggs increased 23 per cent. from 1899 to 1909; but the commercial movement shows a much greater increase. Seven cities combined (New York, Boston, Chicago, St. Louis, Cincinnati, Milwaukee, and San Francisco) received about 369 million dozen eggs in 1909, an increase of 70 per cent. over their receipts in 1899. Population had increased between 1900 and 1910 about 21 per cent. in the United States, but 31 per cent. in the seven cities named above. The receipts at these seven cities in 1909 were equivalent to about 23 per cent. of the production as reported by the census, as compared with 16 per cent. in 1899.

In January, 1910, and again in June, 1910, the Department of Agriculture made an investigation through its agents, in 63 cities throughout the United States, concerning the price which retail dealers were paying for eggs and the price which consumers were paying for fresh eggs; at the same time inquiries were made through correspondence with crop reporters of the Bureau of Statistics adjacent to these cities concerning the prices received by producers. From the reports received it appears that in June, 1910, consumers paid an average of 24 cents per dozen; retail dealers paid 19.8 cents, and near-by producers received 18.7 cents; in January, 1910, consumers paid 38.1 cents, retailers paid 32 cents, and near-by producers received 30.4. The average price to producers for the entire United States in the middle of June, 1910, was about 18.3 cents, and in the last week of January, 1910, about 29 cents.



COMPOSITION OF MILK.

It has been estimated that the average man must be supplied daily with an amount of energy in the form of food which is the equivalent of from 3,000 to 3,500 calories. In order to obtain this energy one would have to consume about eight pints of milk daily, or about a tumblerful every hour of the working day.

ORCHARD AND VINEYARD PRODUCTS.

Products.	Trees of Bearing Age: 1910.		Products of 1909.		Trees Reported June 1, 1900.	Products of 1899, Bushels.
	Farms reporting.	Number.	Bushels.	Value.		
Fruits: (orchard)						
Apples......	2,980,398	151,323,000	147,522,000	$83,231,000	201,794,000	175,397,000
Cherries.....	1,248,667	11,822,044	4,126,099	7,231,160	11,943,287	2,873,499
Peaches.....	1,843,610	94,507,000	35,470,000	28,781,000	99,919,000	15,434,000
Pears.......	1,276,366	15,172,000	8,841,000	7,911,000	17,716,000	6,625,000
Plums, etc...	1,120,130	23,445,009	15,480,170	10,299,495	30,780,892	8,764,032
Fruits: (vineyard)						
Grapes......	923,396	224,098,000	2,570,996,000	22,025,000	182,228,000	1,300,751,000
Fruits: (sub-tropical)						
Oranges.....	....	9,367,047	[1]19,289,391	17,257,278	....	....
Lemons.....	....	938,870	2,728,341	2,939,512	....	....

[1]Boxes.

JAW LEVERAGE REQUIRED FOR VARIOUS MEATS.

CUTS OF MEAT.

The method of dividing up the carcasses of slaughtered animals varies considerably in different localities. In order that there may be no confusion on this account the character of the cuts of beef, veal, pork and mutton is shown in the diagrams given on page 62.

THE FUNCTIONS AND USES OF FOODS.

BY C. F. LANGWORTHY, PH. D.
Office of Experiment Stations.

In this article a number of the terms used in discussing food are defined and some of the principles of nutrition are briefly stated. The average composition of a number of the more common American foods is quoted as well as the commonly accepted dietary standards. With the aid of such data, the nutritive value of any given diet may be computed and its comparative value ascertained.

Ordinary food materials, such as meat, fish, eggs, potatoes, wheat, etc., consist of:

Refuse.—As the bones of meat and fish, shells of shellfish, skins of potatoes, bran of wheat, etc.

Edible Portion.—As the flesh of meat and fish, the white and yolk of eggs, wheat flour, etc. The edible portion consists of water and nutritive ingredients, or nutrients. The nutritive ingredients are ***protein, fats, carbohydrates*** and ***mineral matters.***

The water, refuse, and salt of salted meat and fish are called non-nutrients. In comparing the values of different food materials for nourishment they are left out of account.

USE OF NUTRIENTS.

Food is used in the body to build and repair tissue and to furnish energy. The manner in which the valuable constituents are utilized in the body may be expressed in tabular form as follows:

THE RACE OF FOODS FOR FIRST PLACE IN THE DIGESTION RACE.

Protein. White (albumen) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.	Forms tissue (muscles, tendon, and probably fat).	All serve as *fuel* and yield *energy* in form of heat and muscular strength.
Fats. Fat of meat, butter, olive oil, oils of corn and wheat, etc.	Form fatty tissue.	
Carbohydrates. Sugar, starch, etc.	Transformed into fat.	
Mineral matters (ash). Phosphates of lime, potash, soda, etc.	Aid in forming bone, assist in digestion, etc.	

The Fuel Value of Food.—Heat and muscular power are forms of force or energy. The energy is developed as the food is consumed in the body. The unit commonly used in this measurement is the calorie, the amount of heat which would raise the temperature of a pound of water 4 deg. Fahrenheit. Instead of this unit some unit of mechanical energy might be used—for

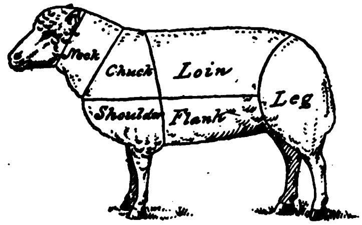


DIAGRAM OF CUTS OF MUTTON.

instance, the foot-ton, which represents the force required to raise one ton one foot. One calorie is equal to very nearly 1.53 foot-tons.

The following general estimate has been made for the average amount of potential energy in 1 pound of each of the classes of nutrients:

	Calories.
In 1 pound of protein........	1,860
In 1 pound of fats..........	4,220
In 1 pound of carbohydrates..	1,860

In other words, when we compare the nutrients in respect to their fuel values, their capacities for yielding heat and mechanical power,

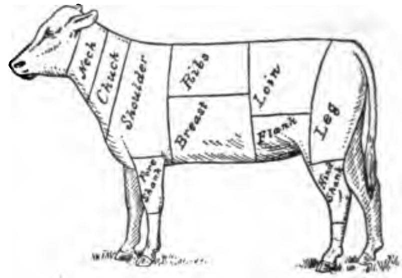


DIAGRAM OF CUTS OF VEAL.

a pound of protein of lean meat or albumen of egg is just about equivalent to a pound of sugar or starch, and a little over two pounds of either would

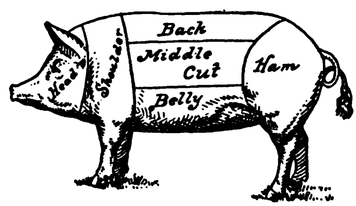


DIAGRAM OF CUTS OF PORK.

be required to equal a pound of the fat of meat or butter or the body fat.

Within recent years analyses of a large number of samples of foods have been made in this country. In the tables on pages 63–65 the results of a number of these analyses are given:

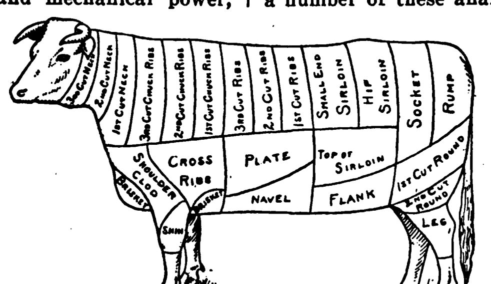


DIAGRAM OF CUTS OF BEEF.

AVERAGE COMPOSITION OF AMERICAN FOOD PRODUCTS.

Food Materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel Value per Lb.
ANIMAL FOOD.							Calories.
Beef, fresh:	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	
Chuck, including shoulder	17.3	54.0	15.8	12.5	......	0.7	820
Chuck ribs	19.1	53.8	15.3	11.1	......	.8	755
Flank	5.5	56.1	18.6	19.9	......	.8	1,185
Loin	13.3	52.9	16.4	16.9	......	.9	1,020
Porterhouse steak	12.7	52.4	19.1	17.9	......	.8	1,110
Sirloin steak	12.8	54.0	16.5	16.1	......	.9	985
Neck	31.2	45.3	14.2	9.2	......	.7	650
Ribs	20.1	45.3	14.4	20.0	......	.7	1,110
Rib rolls	......	64.8	19.4	15.5	......	.9	1,015
Round	8.5	62.5	19.2	9.2	......	1.0	745
Rump	19.0	46.9	15.2	18.6	......	.8	1,065
Shank, fore	38.3	43.2	13.2	5.2	......	.6	465
Shoulder and clod	17.4	57.0	16.5	8.4	......	.9	660
Fore quarter	20.6	49.5	14.4	15.1	......	.7	905
Hind quarter	16.3	52.0	16.1	15.4	......	.8	950
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	......	4.6	1,271
Tongue, pickled	6.0	58.9	11.9	19.2	......	4.3	1,030
Dried, salted, and smoked	4.7	53.7	26.4	6.9	......	8.9	780
Canned boiled beef	......	51.8	25.5	22.5	......	1.3	1,425
Canned corned beef	......	51.8	26.3	18.7	......	4.0	1,280
Veal:							
Breast	23.3	52.5	15.7	8.2	......	.8	635
Leg	11.7	63.4	18.3	5.8	......	1.0	585
Leg cutlets	3.4	68.3	20.1	7.5	......	1.0	690
Fore quarter	24.5	54.2	15.1	6.0	......	.7	535
Hind quarter	20.7	56.2	16.2	6.6	......	.8	580
Mutton:							
Flank	9.9	39.0	13.8	36.9	......	.6	1,815
Leg, hind	17.7	51.9	15.4	14.5	......	.8	900
Shoulder	22.1	46.8	13.7	17.1	......	.7	975
Fore quarter	21.2	41.6	12.3	24.5	......	.7	1,265
Hind quarter, without tallow	19.3	43.3	13.0	24.0	......	.7	1,255
Lamb:							
Breast	19.1	45.5	15.4	19.1	......	.8	1,090
Leg, hind	13.8	50.3	16.0	19.7	......	.9	1,130
Pork, fresh:							
Flank	18.0	48.5	15.1	18.6	......	.7	1,065
Ham	10.3	45.1	14.3	29.7	......	.8	1,520
Loin chops	19.3	40.8	13.2	26.0	......	.8	1,340
Shoulder	12.4	44.9	12.0	29.8	......	.7	1,480
Tenderloin	......	66.5	18.9	13.0	......	1.0	900
Pork, salted, cured, and pickled:							
Ham, smoked	12.2	35.8	14.5	33.2	......	4.2	1,670
Shoulder, smoked	18.9	30.7	12.6	33.0	......	5.0	1,625
Salt pork	......	7.9	1.9	86.2	......	3.9	3,670
Bacon, smoked	8.7	18.4	9.5	59.4	......	4.5	2,685
Sausage:							
Bologna	3.3	55.2	18.2	19.7	......	3.8	1,170
Farmer	3.9	22.2	27.9	40.4	......	7.3	2,225
Frankfort	......	57.2	19.6	18.6	1.1	3.4	1,170
Soups:							
Celery, cream of	......	88.6	2.1	2.8	5.0	1.5	250
Beef	......	92.9	4.4	.4	1.1	1.2	120
Meat stew	......	84.5	4.6	4.3	5.5	1.1	370
Tomato	......	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	......	.7	295
Fowls	25.9	47.1	13.7	12.3	......	.7	775
Goose	17.6	38.5	13.4	29.8	......	.7	1,505
Turkey	22.7	42.4	16.1	18.4	......	.8	1,075
Fish:							
Cod, dressed	29.9	58.5	11.1	.2	......	.8	215
Halibut, steaks or sections	17.7	61.9	15.3	4.4	......	.9	470
Mackerel, whole	44.7	40.4	10.2	4.2	......	.7	365
Perch, yellow, dressed	35.1	50.7	12.8	.7	......	.9	265
Shad, whole	50.1	35.2	9.4	4.8	......	.7	380
Shad, roe	......	71.2	20.9	3.8	2.6	1.5	600
Fish, salt: Cod	24.9	40.2	19.0	.4	......	18.5	315

AVERAGE COMPOSITION OF AMERICAN FOOD PRODUCTS—*Continued.*

Food Materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel Value per Lb.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Calories.
Fish, canned:							
Salmon	14.2	56.8	19.5	7.5	......	2.0	680
Sardines	[1] 5.0	53.6	23.7	12.1	......	5.3	950
Shellfish:							
Oysters, "solids"	......	88.3	6.0	1.3	3.3	1.1	230
Clams	......	80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	195
Lobsters	61.7	30.7	5.9	.7	.2	.8	140
Eggs: Hens' eggs	[2] 11.2	65.5	11.9	9.3	......	.9	635
Dairy products, etc.:							
Butter	......	11.0	1.0	85.0	......	3.0	3,605
Whole milk	......	87.0	3.3	4.0	5.0	.7	325
Skim milk	......	90.5	3.4	.3	5.1	.7	170
Buttermilk	......	91.0	3.0	.5	4.8	.7	165
Condensed milk	......	26.9	8.8	8.3	54.1	1.9	1,520
Cream	......	74.0	2.5	18.5	4.5	.5	910
Cheese, Cheddar	......	27.4	27.7	36.8	4.1	4.0	2,145
Cheese, full cream	......	34.2	25.9	33.7	2.4	3.8	1,950
VEGETABLE FOOD.							
Flour, meal, etc.:							
Entire-wheat flour	......	11.4	13.8	1.9	71.9	1.0	1,675
Graham flour	......	11.3	13.3	2.2	71.4	1.8	1,670
Wheat flour, patent roller process—							
High-grade and medium	......	12.0	11.4	1.0	75.1	.5	1,650
Low grade	......	12.0	14.0	1.9	71.2	.9	1,665
Macaroni	......	78.4	3.0	1.5	15.8	1.3	415
Crushed wheat	......	10.1	11.1	1.7	75.5	1.6	1,685
Buckwheat flour	......	13.6	6.4	1.2	77.9	.9	1,620
Corn meal	......	12.5	9.2	1.9	75.4	1.0	1,655
Oatmeal	......	7.3	16.1	7.2	67.5	1.9	1,860
Rice	......	12.3	8.0	.3	79.0	.4	1,630
Tapioca	......	11.4	.4	.1	88.0	.1	1,650
Starch	......	......	......	......	90.0	......	1,675
Bread, pastry, etc.:							
White bread	......	35.3	9.2	1.3	53.1	1.1	1,215
Brown bread	......	43.6	5.4	1.8	47.1	2.1	1,050
Graham bread	......	35.7	8.9	1.8	52.1	1.5	1,210
Whole-wheat bread	......	38.4	9.7	.9	49.7	1.3	1,140
Rye bread	......	35.7	9.0	.6	53.2	1.5	1,180
Cake	......	19.9	6.3	9.0	63.3	1.5	1,675
Cream crackers	......	6.8	9.7	12.1	69.7	1.7	1,990
Oyster crackers	......	4.8	11.3	10.5	70.5	2.9	1,965
Soda crackers	......	5.9	9.8	9.1	73.1	2.1	1,925
Sugars, etc.:							
Molasses	......	25.1	2.4	......	69.3	3.2	1,290
Candy	......	......	......	......	96.0	......	1,785
Honey [3]	......	18.2	.4	......	81.2	.2	1,520
Sugar, granulated	......	......	......	......	100 0	......	1,800
Maple sirup	......	......	......	......	71.4	......	1,330
Vegetables:[4]							
Beans, dried	......	12.6	22.5	1.8	59.6	3.5	1,605
Beans, Lima, shelled	......	68.5	7.1	.7	22.0	1.7	570
Beans, string	7.0	83.0	2.1	.3	6.9	.7	180
Beets	20.0	70.0	1.3	.1	7.7	.9	170
Cabbage	15.0	77.7	1.4	.2	4.8	.9	125
Celery	20.0	75.6	.9	.1	2.6	.8	70
Corn, green (sweet), edible portion	......	75.4	3.1	1.1	19.7	.7	470
Cucumbers	15.0	81.1	.7	.2	2.6	.4	70
Lettuce	15.0	80.5	1.0	.2	2.5	.8	75
Mushrooms	......	88.1	3 5	.4	6.8	1.2	210
Onions	10.0	78.9	1.4	.3	8.9	.5	205
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	240
Peas (*Pisum sativum*), dried	......	9.5	24.6	1.0	62.0	2.9	1,655

[1] Refuse, oil. [2] Refuse, shell.

[3] Contained on an average cane sugar 2.8 and reducing sugar 71.1 per cent. The reducing sugar was composed of about equal amounts of glucose (dextrose) and fruit sugar (levulose).

[4] Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and cannot be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

AVERAGE COMPOSITION OF AMERICAN FOOD PRODUCTS—*Continued.*

Food Materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel Value per Lb.
Vegetables—(*Continued*):	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Calories.
Peas (*Pisum sativum*), shelled	......	74.6	7.0	0.5	16.9	1.0	465
Cowpeas, dried	......	13.0	21.4	1.4	60.8	3.4	1,590
Potatoes	20.0	62.6	1.8	.1	14.7	.8	310
Rhubarb	40.0	56.6	.4	.4	2.2	.4	65
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	640
Spinach	......	92.3	2.1	.3	3.2	2.1	110
Squash	50.0	44.2	.7	.2	4.5	.4	105
Tomatoes	......	94.3	.9	.4	3.9	.5	105
Turnips	30.0	62.7	.9	.1	5.7	.6	125
Vegetables, canned:							
Peas (*Pisum sativum*), green	......	85.3	3.6	.2	9.8	1.1	255
Corn, green	......	76.1	2.8	1.2	19.0	.9	455
Tomatoes	......	94.0	1.2	.2	4.0	.6	105
Fruits, berries, etc., fresh:[1]							
Apples	25.0	63.3	.3	.3	10.8	.3	220
Bananas	35.0	48.9	.8	.4	14.3	.6	300
Grapes	25.0	58.0	1.0	1.2	14.4	.4	335
Lemons	30.0	62.5	.7	.5	5.9	.4	145
Muskmelons	50.0	44.8	.3	......	4.6	.3	90
Oranges	27.0	63.4	.6	.1	8.5	.4	170
Pears	10.0	76.0	.5	.4	12.7	.4	260
Persimmons, edible portion	......	66.1	.8	.7	31.5	.9	630
Raspberries	......	85.8	1.0	......	12.6	.6	255
Strawberries	5.0	85.9	.9	.6	7.0	.6	175
Watermelons	59.4	37.5	.2	.1	2.7	.1	60
Fruits, dried:							
Apples	......	28.1	1.6	2.2	66.1	2.0	1,350
Apricots	......	81.4	.9	......	17.3	.4	340
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,450
Figs	......	18.8	4.3	.3	74.2	2.4	1,475
Nuts:							
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,660
Beechnuts	40.8	2.3	13.0	34.0	7.8	2.1	1,820
Brazil nuts	49.6	2.6	8.6	33.7	3.5	2.0	1,655
Butternuts	86.4	.6	3.8	8.3	.5	.4	430
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	945
Chestnuts, dried	24.0	4.5	8.1	5.3	56.4	1.7	1,425
Cocoanuts	[2] 48.8	7.2	2.9	25.9	14.3	.9	1,413
Cocoanut, prepared	......	3.5	6.3	57.4	31.5	1.3	3,125
Filberts	52.1	1.8	7.5	31.3	6.2	1.1	1,575
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,265
Pecans, polished	53.2	1.4	5.2	33.3	6.2	.7	1,620
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,935
Piñon (*Pinus edulis*)	40.6	2.0	8.7	36.8	10.2	1.7	1,905
Walnuts, California, black	74.1	.6	7.2	14.6	3.0	.5	805
Walnuts, California, soft-shell	58.1	1.0	6.9	26.6	6.8	.6	1,375
Raisins	10.0	13.1	2.3	3.0	68.5	3.1	1,455
Miscellaneous:							
Chocolate	......	5.9	12.9	48.7	30.3	2.2	2,860
Cocoa, powdered	......	4.6	21.6	28.9	37.7	7.2	2,320
Cereal coffee, infusion (1 part boiled in 20 parts water)[3]	......	98.2	.2	......	1.4	.2	30

[1] Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

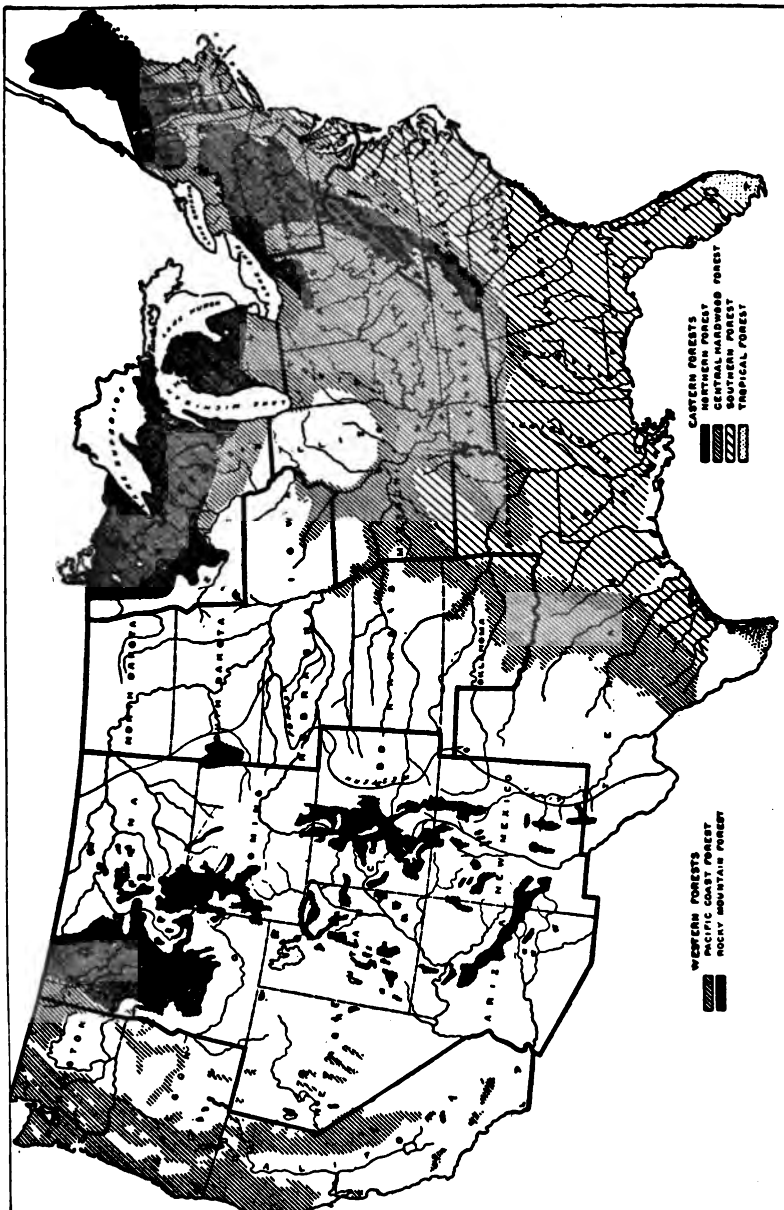
[2] Milk and shell.

[3] The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage Infusions of genuine coffee and of tea like the above contain practically no nutrients.

PRODUCTS OF THE FISHERIES OF THE UNITED STATES: 1908.

Species.	Pounds.	Dollars.
Alewives	89,978,000	589,000
Black bass	3,313,000	255,000
Bluefish	7,647,000	506,000
Bream or Sunfish	4,738,000	120,000
Buffalo fish	16,729,000	498,000
Butterfish	6,855,000	237,000
Carp, German	42,763,000	1,135,000
Catfish	17,817,000	785,000
Cod	109,453,000	2,903,000
Croaker	8,143,000	226,000
Cusk	6,344,000	105,000
Drum, fresh-water	6,532,000	154,000
Drum, salt-water	4,576,000	164,000
Eels	3,358,000	203,000
Flounders	23,346,000	588,000
Haddock	59,987,000	1,308,000
Hake	34,340,000	464,000
Halibut	34,441,000	1,562,000
Herring	125,050,000	796,000
Herring (lake)	41,118,000	989,000
Mackerel	12,103,000	848,000
Menhaden	394,776,000	893,000
Mullet	33,703,000	908,000
Perch, white	2,412,000	137,000
Perch, yellow	7,898,000	258,000
Pike and Pickerel	2,959,000	174,000
Pike perch	15,247,000	580,000
Pollock	29,462,000	402,000
Pompano	570,000	71,000
Rockfish	2,454,000	66,000
Salmon	90,417,000	3,347,000
Scup	8,414,000	290,000
Sea bass	6,352,000	284,000
Shad	27,641,000	2,113,000
Smelt	4,340,000	174,000
Snapper, red	13,498,000	636,000
Spanish mackerel	3,806,000	194,000
Squeteague	49,869,000	1,776,000
Striped bass	3,657,000	314,000
Sturgeon	2,072,000	157,000
Suckers	8,555,000	215,000
Swordfish	2,714,000	198,000
Trout	12,024,000	800,000
Whitefish	7,722,000	524,000
Lobsters	15,279,000	1,931,000
Shrimp	14,374,000	390,000
Clams, hard	7,805,000	1,317,000
Clams, soft	8,654,000	553,000
Oysters	233,309,000	15,713,000
Mussel shells	81,869,000	392,000
Pearls and slugs	....	300,000
Terrapin	368,000	80,000
Turtles	1,088,000	40,000
Sponges	622,000	545,000
Alligator hides	372,000	61,000
Mink skins	22,000	89,000
Muskrat skins	149,000	136,000
Otter skins	7,600	30,000
Whalebone	63,000	215,000
Scallops	2,414,000	317,000
Oil, sperm	3,391,000	252,000
Oil, whale	573,000	30,000
Irish moss	772,000	26,000

The total quantity and value of the products of the fisheries of the United States including the items mentioned above and all other fish products was 1,893,454,000 pounds, valued at $54,031,000. No later figures are available at time of publication. In many cases there was an increase, in other cases a decrease.



FORESTS OF THE UNITED STATES.

ESTIMATED AREA OF EXISTING NATIONAL FORESTS JANUARY 31, 1913.

	Acres.		Acres.
Alaska	26,748,850	Nevada	5,595,310
Arizona	13,339,390	New Mexico	10,173,890
Arkansas	2,225,890	North Dakota	13,920
California	26,921,945	Oklahoma	61,640
Colorado	14,648,890	Oregon	16,023,220
Florida	674,970	Porto Rico	65,950
Idaho	19,550,827	South Dakota	1,337,750
Kansas	303,937	Utah	7,735,639
Michigan	163,771	Washington	11,684,360
Minnesota	1,570,850	Wyoming	8,633,463
Montana	18,977,580		
Nebraska	556,700	Total area	187,008,796

	Acres.
Area embraced in additions to national forests from June 30, 1911	484,204
Area embraced in eliminations from national forests from June 30, 1911	4,083,651
Area embraced in existing national forests June 30, 1911	190,608,243
Area embraced in existing national forests January 31, 1913	187,008,796
Area decreased during the period June 30, 1911, to January 31, 1913	3,599,447

NATIONAL MONUMENTS.

States and names.	Date created.	Area.
		Acres.
Alaska:		
Sitka	Mar. 23.1910	[1] 57,00
Arizona:		
Grand Canyon [2]	Jan. 11, 1908	[1] 806,400.00
Montezuma Castle	Dec. 8, 1906	160.00
Navajo	Mar. 20, 1909	[3] 600.00
Tonto [2]	Dec. 19, 1907	[1] 640.00
Tumacacori	Sept. 15, 1908	10.00
Petrified Forest	July 31, 1911	[4] 25,625.60
California:		
Cinder Cone [2]	May 6, 1907	[1] 5,120.00
Lassen Peak [2]	do	[1] 1,280.00
Muir Woods	Jan. 9, 1908	295.00
Pinnacles	Jan. 16, 1908	[1] 2,080.00
Devil Postpile [2]	July 6, 1911	[1] 800.00
Colorado:		
Wheeler [2]	Dec. 17, 1908	300.00
Colorado	May 24, 1911	13,883.06
Montana:		
Big Hole	June 23, 1910	[1] 5.00
Lewis and Clark Cavern	May 16, 1911	[4] 160.00
New Mexico:		
Chaco Canyon	Mar. 11, 1907	20,629.40
El Morro	Dec. 8, 1906	160.00
Gila Cliff Dwellings [2]	Nov. 16, 1907	160.00
Gran Quivira	Nov. 1, 1909	[1] 160.00
Oregon:		
Oregon Caves [2]	July 12, 1909	[1] 480.00
South Dakota:		
Jewel Cave [2]	Feb. 7, 1908	[1] 1,280.00
Utah:		
Mukuntuweap	July 31, 1909	[1] 15,840.00
Natural Bridges	Sept. 25, 1909	[4] 2,740.00
Rainbow Bridge	May 30, 1910	160.00
Washington:		
Mount Olympus [2]	Mar. 2, 1909	[1] 608,640.00
Wyoming:		
Devils Tower	Sept. 24, 1906	1,152.91
Shoshone Cavern	Sept. 21, 1909	210.00
Total		[1] 1,509,027.97

[1] Estimated area.
[2] Under jurisdiction of Department of Agriculture.
[3] Based on 15 known ruins; within Indian reservation.
[4] According to second proclamation.

LUMBER AND TIMBER PRODUCTS STATISTICS.

In 1909 there were in the United States 40,671 establishments; 784,989 persons engaged in the industry, of which number, 48,825 were proprietors and firm members, 19,840 were salaried officers, superintendents and managers; 18,088 were male, and 3,717 female clerks. The average number of wage earners was 695,019: the number in the maximum month, November, was 739,160, and in the minimum month, January, 649,239. The total number of wage earners on December 15, 1909, or the nearest representative day, was 838,160, of which number, 826,978 were males, and 4,027 females, all being 16 years of age and over; while 6,886 males, and 269 females, were under 16. The capital invested was $1,176,675,407. The total expenses were $995,622,839, of which the officials received $22,448,332, clerks $17,979,364, wage earners $318,739,207, fuel and rent of power $3,082,287, other materials $503,035,292, rent of factory or works $2,623,146, taxes including internal revenue $9,863,384, contract work $32,491,242, and other miscellaneous work $76,360,585. The primary horse-power was 2,840,082. The value of products $1,156,128,747. The value added by manufacture, which is the difference between cost of materials and value of products, was $648,011,168.

LUMBER AND TIMBER PRODUCTS.

The total value of the lumber and timber products of the United States, in 1909, was $724,705,760. The total quantity of lumber made was 44,509,761 M. feet, board measure, valued at $684,479,859: Of this amount the softwoods comprised 33,896,959 M. feet, board measure, valued at $477,345,046. They were subdivided as follows:

16,277,185	M. ft. yellow pine, valued at	$206,505,297
1,499,985	" " western " " "	23,077,854
3,900,034	" " white " "	70,830,131
4,856,378	" " Douglas fir " "	60,435,793
3,051,399	" " hemlock " "	42,580,800
1,748,547	" " spruce " "	29,561,315
955,635	" " cypress " "	19,549,741
521,630	" " redwood " "	7,720,124
346,008	" " cedar " "	6,901,948
740,158	" " all other kinds " "	10,182,043

Of the total quantity of lumber, the output of hardwoods was 10,612,802 M. feet, board measure, valued at $207,134,813. They were divided as follows:

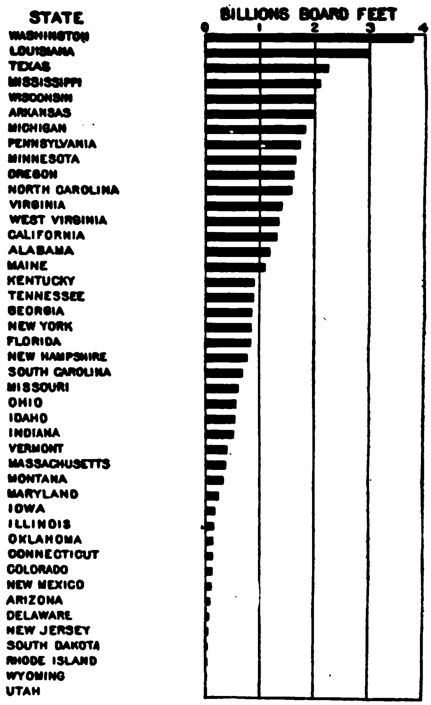
4,414,457	M. ft. oak, valued at	$90,512,069
1,106,604	" " maple, valued at	17,447,814
706,945	" " red gum, valued at	9,334,268
663,891	" " chestnut, " "	10,703,130
452,370	" " birch, " "	7,666,186
399,151	" " basswood, " "	7,781,563
347,456	" " elm, " "	6,088,098
265,600	" " cottonwood, " "	4,794,424
291,209	" " ash, " "	7,116,089
333,929	" " hickory, " "	10,283,776
46,108	" " walnut, " "	1,972,835
56,511	" " sycamore, " "	834,612
1,528,571	" " all other kinds, valued at	32,599,949

SHINGLES, 1911.

During the year 1911 there were 12,113,867 thousand shingles produced in the United States. They were cut from the following woods in the following quantities: Cedar 9,592,179 thousand; cypress 1,230,645; yellow pine 650,332; redwood 395,786; white pine 83,679; spruce 12,381; chestnut 40,840; hemlock 26,171; western pine 15,882; and all other woods 65,972 thousands. Washington produced 63.9 per cent. of all the shingles used and Alabama, Arkansas, California, Florida, Georgia, Louisiana, Maine, Michigan, North Carolina, Oregon and Wisconsin produced from one per cent. to three per cent. of the total production.

POLES AND TIES, 1911.

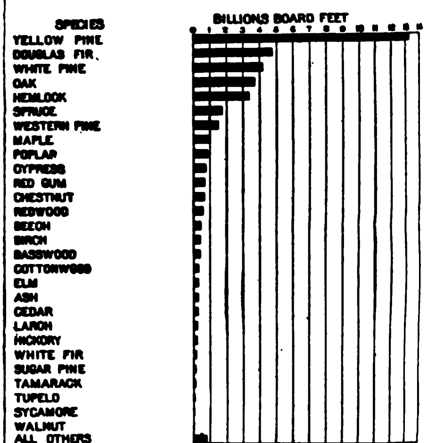
During the year 1911 there were 135,053,000 ties used by the steam and electric railroads of the United States. Of this number 59,508,000 were oak; 24,265,000 southern pines; 8,015,000 cedar; 7,542,000 chestnut; 11,253,000 Douglas fir; 4,138,000 tamarack; 5,857,000 cypress; 3,686,000 hemlock; 2,696,000 western yellow pine; 1,820,000 redwood; 1,293,000 gum; and 4,980,000 of all other kinds. During the same period there were 3,418,020 poles purchased for electric wires of all kinds. They were of the following woods: Cedar 2,100,144; chestnut 693,489; oak 199,590; pine 161,690; cypress 72,995; and all other kinds 190,112.



LUMBER CUTS BY STATES, 1907

Production of Turpentine and Resin: Quantity and Value, 1908–1910.

During the year 1910 there were 27,750,000 gallons of turpentine produced, having a total value of $17,680,000, against 36,589,000 gallons and a value of $14,112,400 in 1908. The total production of resin in 1910 was 3,404,000 barrels of 280 pounds and was valued at $18,255,000. For the year 1908 there were 4,288,283 barrels produced having a total value of $17,783,550.



RELATIVE CUTS FOR 1907.

THE COMING OF THE OIL DRIVEN STEAMER WILL CONSERVE BOTH FORESTS AND COAL FIELDS

PULP WOOD: 1911.

The total consumption of pulp wood in the United States in 1911 amounted to 4,328,052 cords, with 268 active mills. The kinds of wood consumed follows: Spruce, domestic, 1,612,355 cords; spruce, imported, 903,375 cords; hemlock, 616,663 cords; poplar, domestic and imported, 368,224 cords; balsam fir, 191,779 cords; pine, 124,019 cords; beech, 44,320 cords; slabwood, etc., 280,534 cords; all other, 186,783 cords.

The production of air-dry pulp in 1911 amounted to 2,686,134 tons, exceeding the output in 1910 by 152,158 tons, or 6 per cent. The method of manufacture was distributed as follows: Mechanical, 1,229,719 tons; sulphite, 1,126,496 tons; soda, 317,764 tons; sulphate, 12,155 tons.

PROBABLE FUTURE LAND CLASSIFICATION OF NORTH AMERICA.

Comparison of Log Rules for Board Measure.

Sixteen-foot Logs.

	Name of Rule.	6	8	10	12	14	16	18
		Diameter in inches. — Board feet.						
1	Scribner[a]	18	32	54	79	114	159	213
2	Doyle	4	16	36	64	100	144	196
3	Doyle and Scribner	4	16	36	64	100	144	196
4	Holland or Maine	20	44	68	105	142	179	232
5	Humphrey or Vermont	24	43	66	96	130	170	217
6	Bangor	23	41	69	100	137	182	238
7	Cumberland River			47	68	93	121	153
8	Hanna		32	51	80	117	160	213
9	Spaulding			50	77	114	161	216
10	Favorite				64	98	142	197
11	Baxter		34	56	84	117	156	200
12	Doyle and Baxter			36	64	100	144	196
13	Square of three-fourths	27	48	75	108	147	192	243
14	Square of two-thirds			58	85	114	150	192
15	Herring		25	49	77	107	142	183
16	Dusenberry			42	68	100	136	170
17	Orange River				76	104	136	173
18	Chapin			64	84	112	144	186
19	Northwestern		33	61	77	117	170	206
20	Derby	28	49	75	110	148	195	248
21	Partridge	26	46	68	102	140	180	236
22	Parsons[b]	21	41	64	100	140	179	231
23	Ropp				69	109	157	211
24	Stillwell			65	96	133	176	225
25	Baughman's rotary saw	17	41	70	105	145	193	244
26	Baughman's band saw	20	41	73	112	156	209	270
27	Saco River[b]	26	49	75	108	147	192	246
28	Ballon	22	40	61	79	117	170	206
29	Wilson	23	46	67	101	144	184	244
30	Wilcox				66	101	144	180
31	Warner		30	40	62	98	128	162
32	Boynton		32	60	90	124	170	216
33	Forty-five		38	61	90	125	168	218
34	White		30	51	79	114	161	214
35	Finch and Apgar				74	112	157	203
36	Constantine		67	105	151	213	268	339
37	Ake		41	65	95	128	167	212
38	Quebec	16	32	59	80	120	160	213
39	British Columbia			55	84	119	160	207
40	New Brunswick				96	130	170	229
41	International	20	45	70	105	150	200	255
42	Champlain	22	43	70	105	146	193	247
43	Clement	18	37	62	94	131	175	226
44	Click	17	35	60	91	129	173	223

[a] Values for 6, 8, and 10 inches are those used by the Santa Clara Lumber Company, New York.

Comparison of Log Rules for Board Measure

Sixteen-foot Logs—Continued.

20	22	24	26	28	30	32	34	36	38	
Diameter in inches. — Board feet.										
280	334	404	509	582	657	736	800	923	1,068	1
256	324	400	484	576	676	784	900	1,024	1,156	2
256	324	400	484	582	657	736	800	923	1,068	3
302	363	439	507	614	706	795	900	1,026	1,135	4
267	320	384								5
300	369	444	526	609	697	792	892			6
190	229	268	320	372	427	485	548	614	685	7
272	336	416	501	576	656	741	832	933	1,066	8
276	341	412	488	569	656	748	845	950	1,064	9
248	324	392	476	562	632	725	845	920	1,037	10
250	305	366	432	504	582	665	754	848		11
256	305	366	432	504	582	665	754	848		12
300	365	432	507	588	675	768	867	972		13
236	285	341	400	464	533	605	684	768	854	14
230	284	344	411	485	567	655	752	857	963	15
229	285	346	414	487	567	652	744	841	945	16
213	258	308	360	418	480	546	616	692	769	17
233	294	374	465	563	666	777	896	1,027	1,161	18
248	324	392	450	536	632	725	845	920	1,037	19
307	368	438	512	593	680	773	872	977		20
288	350	416	486	564	650	738	834	998		21
300	366	433	506	600	705					22
272	339	413	493	579	672	771	877	989	1,107	23
261	320	385	456	533	588	675	768			24
310	382	457	540	633	722	822	934	1,054	1,142	25
340	417	500	590	686	790	900	1,022	1,182	1,286	26
302	366	436	513	590	674	771				27
280										28
306	374	448	529	616	713	814	922			29
240	313	373	446	513	592	673	754	853	973	30
203	258	316	372	431	490	560	630			31
266	322	384	450	522						32
275	341	415	498	590	691	803	925	1,058		33
290	338	402	492	575	649	728	797			34
258	318	400	474	552	624	733	840	928	1,054	35
416	507	603	708	821	942	1,072	1,210	1,356	1,511	36
261	316	377	441	512	588	669				37
280	347	420	507	580	673	760	867	947	1,040	38
261	320	386	457	535	619	708	804	906	1,015	39
300	362	432								40
320	390	470	555	645	745	850	965	1,085	1,210	41
308	376	450	532	620	714	814	923	1,038	1,159	42
282	345	414	490	571	659	753	854	961	1,074	43
280	343	413	489	571	660	755	857	965	1,079	44

[b] Values read off from a scaler's stick.

Comparison of Log Rules for Board Measure—Continued

SIXTEEN-FOOT LOGS—Continued.

Comparison of Log Rules for Board Measure

SIXTEEN-FOOT LOGS—Continued.

	NAME OF RULE.	DIAMETER IN INCHES.											
		40	42	44	46	48	50	52	54	56	58	60	
		BOARD FEET.											
1	Scribner	1,204	1,343	1,480									1
2	Doyle	1,296	1,444	1,600	1,764	1,936	2,116	2,304	2,500	2,704	2,916	3,136	2
3	Doyle and Scribner	1,204	1,343	1,480									3
4	Holland or Maine	1,261	1,401	1,523	1,701	1,848							4
5	Humphrey or Vermont												5
6	Bangor												6
7	Cumberland River	759	835	918	1,003	1,092	1,172	1,281	1,382	1,486	1,594	1,767	7
8	Hanna	1,200	1,333	1,477	1,616	1,765	1,930						8
9	Spaulding	1,185	1,312	1,448	1,581	1,724	1,872	2,025	2,184	2,350	2,524	2,704	9
10	Favorite	1,160	1,266	1,402	1,546	1,696							10
11	Baxter												11
12	Doyle and Baxter												12
13	Square of three-fourths												13
14	Square of two-thirds	946	1,045	1,146	1,253	1,365	1,481						14
15	Herring	1,067	1,176										15
16	Dusenberry	1,054	1,170										16
17	Orange River	853											17
18	Chapin	1,296	1,437	1,577	1,721	1,865	2,016	2,160	2,313	2,467	2,627	2,791	18
19	Northwestern	1,160	1,266	1,402	1,546	1,696							19
20	Derby												20
21	Partridge												21
22	Parsons												22
23	Ropp	1,232	1,363	1,501	1,645	1,795	1,952	2,115	2,285	2,461	2,643	2,882	23
24	Stillwell												24
25	Baughman's rotary saw	1,294	1,430	1,577	1,732	1,884	2,041	2,206	2,396	2,590	2,764	2,898	25
26	Baughman's band saw	1,425	1,582	1,745	1,900	2,089	2,270	2,449	2,636	2,841	3,073	3,265	26
27	Saco River												27
28	Ballon												28
29	Wilson												29
30	Wilcox	1,120											30
31	Warner												31
32	Boynton												32
33	Forty-five												33
34	White												34
35	Finch and Apgar	1,181	1,280	1,410	1,584								35
36	Constantine	1,671	1,846	2,026	2,215	2,425	2,617						36
37	Ake												37
38	Quebec	1,173	1,267										38
39	British Columbia	1,129	1,249	1,376	1,508	1,647	1,791	1,942	2,099	2,262	2,431	2,606	39
40	New Brunswick												40
41	International	1,345	1,490	1,635	1,790	1,955	2,125	2,300	2,485	2,675	2,870	3,075	41
42	Champlain	1,287	1,422	1,564	1,711	1,866	2,028	2,196	2,371	2,553	2,741	2,936	42
43	Clement	1,193	1,319	1,451	1,589	1,734	1,884	2,042	2,205	2,375	2,550	2,733	43
44	Click	1,200	1,327	1,461	1,601	1,747	1,900	2,059					44

Contents of 1-inch Boards of Different Lengths and Widths Given in Board Feet and Twelfths.

Length.	WIDTH OF BOARD (INCHES).																					
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	CONTENTS (BOARD FEET).																					
Feet.																						
4	1	1^{4}	1^{8}	2	2^{4}	2^{8}	3	3^{4}	3^{8}	4	4^{4}	4^{8}	5	5^{4}	5^{8}	6	6^{4}	6^{8}	7	7^{4}	7^{8}	8
5	1^{3}	1^{8}	2^{1}	2^{6}	2^{11}	3^{4}	3^{9}	4^{2}	4^{7}	5	5^{5}	5^{10}	6^{3}	6^{8}	7^{1}	7^{6}	7^{11}	8^{4}	8^{9}	9^{2}	9^{7}	10
6	1^{6}	2	2^{6}	3	3^{6}	4	4^{6}	5	5^{6}	6	6^{6}	7	7^{6}	8	8^{6}	9	9^{6}	10	10^{6}	11	11^{6}	12
7	1^{9}	2^{4}	2^{11}	3^{6}	4^{1}	4^{8}	5^{3}	5^{10}	6^{5}	7	7^{7}	8^{2}	8^{9}	9^{4}	9^{11}	10^{6}	11^{1}	11^{8}	12^{3}	12^{10}	13^{5}	14
8	2	2^{8}	3^{4}	4	4^{8}	5^{4}	6	6^{8}	7^{4}	8	8^{8}	9^{4}	10	10^{8}	11^{4}	12	12^{8}	13^{4}	14	14^{8}	15^{4}	16
9	2^{3}	3	3^{9}	4^{6}	5^{3}	6	6^{9}	7^{6}	8^{3}	9	9^{9}	10^{6}	11^{3}	12	12^{9}	13^{6}	14^{3}	15	15^{9}	16^{6}	17^{3}	18
10	2^{6}	3^{4}	4^{2}	5	5^{10}	6^{8}	7^{6}	8^{4}	9^{2}	10	10^{10}	11^{8}	12^{6}	13^{4}	14^{2}	15	15^{10}	16^{8}	17^{6}	18^{4}	19^{2}	20
11	2^{9}	3^{8}	4^{7}	5^{6}	6^{5}	7^{4}	8^{3}	9^{2}	10^{1}	11	11^{11}	12^{10}	13^{9}	14^{8}	15^{7}	16^{6}	17^{5}	18^{4}	19^{3}	20^{2}	21^{1}	22
12	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
13	3^{3}	4^{4}	5^{5}	6^{6}	7^{7}	8^{8}	9^{9}	10^{10}	11^{11}	13	14^{1}	15^{2}	16^{3}	17^{4}	18^{5}	19^{6}	20^{7}	21^{8}	22^{9}	23^{10}	24^{11}	26
14	3^{6}	4^{8}	5^{10}	7	8^{2}	9^{4}	10^{6}	11^{8}	12^{10}	14	15^{2}	16^{4}	17^{6}	18^{8}	19^{10}	21	22^{2}	23^{4}	24^{6}	25^{8}	26^{10}	28
15	3^{9}	5	6^{3}	7^{6}	8^{9}	10	11^{3}	12^{6}	13^{9}	15	16^{3}	17^{6}	18^{9}	20	21^{3}	22^{6}	23^{9}	25	26^{3}	27^{6}	28^{9}	30
16	4	5^{4}	6^{8}	8	9^{4}	10^{8}	12	13^{4}	14^{8}	16	17^{4}	18^{8}	20	21^{4}	22^{8}	24	25^{4}	26^{8}	28	29^{4}	30^{8}	32
18	4^{6}	6	7^{6}	9	10^{6}	12	13^{6}	15	16^{6}	18	19^{6}	21	22^{6}	24	25^{6}	27	28^{6}	30	31^{6}	33	34^{6}	36
20	5	6^{8}	8^{4}	10	11^{8}	13^{4}	15	16^{8}	18^{4}	20	21^{8}	23^{4}	25	26^{8}	28^{4}	30	31^{8}	33^{4}	35	36^{8}	38^{4}	40
22	5^{6}	7^{4}	9^{2}	11	12^{10}	14^{8}	16^{6}	18^{4}	20^{2}	22	23^{10}	25^{8}	27^{6}	29^{4}	31^{2}	33	34^{10}	36^{8}	38^{6}	40^{4}	42^{2}	44
24	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
26	6^{6}	8^{8}	10^{10}	13	15^{2}	17^{4}	19^{6}	21^{8}	23^{10}	26	28^{2}	30^{4}	32^{6}	34^{8}	36^{10}	39	41^{2}	43^{4}	45^{6}	47^{8}	49^{10}	52
28	7	9^{4}	11^{8}	14	16^{4}	18^{8}	21	23^{4}	25^{8}	28	30^{4}	32^{8}	35	37^{4}	39^{8}	42	44^{4}	46^{8}	49	51^{4}	53^{8}	56
30	7^{6}	10	12^{6}	15	17^{6}	20	22^{6}	25	27^{6}	30	32^{6}	35	37^{6}	40	42^{6}	45	47^{6}	50	52^{6}	55	57^{6}	60
32	8	10^{8}	13^{4}	16	18^{8}	21^{4}	24	26^{8}	29^{4}	32	34^{8}	37^{4}	40	42^{8}	45^{4}	48	50^{8}	53^{4}	56	58^{8}	61^{4}	64

NATIONAL CONSERVATION ASSOCIATION.

The National Conservation Association, with headquarters in the Colorado Building, Washington, D. C., is the organized head of the conservation movement in the United States. The association came into existence because of an urgent need for an organization open to every man and woman who stood for conservation, and which would give them an immediate opportunity for united and effective work.

The first step was taken on July 29, 1909. A group of men who had led in the fight for conservation met and organized the National Conservation Association. Dr. Charles W. Eliot, president emeritus of Harvard University, was made president. Soon afterward Dr. Eliot was made honorary president of the Association, and Mr. Gifford Pinchot became president.

In reply to a request for a statement as to the objects of the Association the following is made:

"The National Conservation Association is fighting for the prompt and orderly development of our natural resources, for the welfare of ourselves and our children, and for the rights of the plain people. The Association is bound neither by political considerations nor official connections. It is free to speak the whole truth.

"That conservation means the use of our natural resources for the benefit of us all and not merely for the profit of a few is already household knowledge. The task which the National Conservation Association has set itself is to get this principle put into practical effect."

CHAPTER III.

MINES AND QUARRIES.

CLAY PRODUCTS OF THE UNITED STATES, 1907.

A pyramid of burned clay would be 4,294 feet high and represents a value of $158,942,369.

SUBDIVISIONS OF GEOLOGIC TIME AND STRATA.

(Prepared Expressly for the American Almanac by Professor Willard C. Hayes, of the United States Geological Survey.)

The rocks forming the earth's crest are divided into three classes: (a) Sedimentary, including all rocks formed by aqueous, organic, glacial and eolian agencies; (b) Igneous, including all rocks that have been solidified from a molten condition, both volcanic and plutonic; (c) Metamorphic, including altered rocks of either sedimentary or igneous origin, in which the acquired are more prominent than the original characteristics, together with the ancient crystalline schists of uncertain origin.

The sedimentary rocks are subdivided into formations, which are groups of strata of similar composition or containing the same fossils. The formations are grouped into larger aggregates called systems, which correspond to divisions of the time scale called periods. The systems and their corresponding periods are of world-wide occurrence, and standard terms are employed throughout the world. Formations, however, are local, and cannot generally be identified in more than a single geologic province. The following standard column is applicable only to the United States. It represents the most recent usage as adopted by the United States Geological Survey.

Subdivisions of Geologic Time.	Subdivisions of Rock Strata.		
Eras.	**Systems.**	**Series.**	**Groups and Formations.**
			South Atlantic and Gulf Coastal Plain.
Age of man	Quaternary	Recent Pleistocene	Columbia loam and gravel.
Cenozoic		Pliocene	Lafayette gravel. Shell Creek limestone. Caloosahatchee limestone.
		Miocene	Chesapeake sands.
Age of mammals	Tertiary	Oligocene	Oak Grove beds. Chipola group. Chattahoochee beds. Vicksburg limestone.
		Eocene	Jackson clays. Claiborn limestone. Hatchetigbee clays. Midway limestone.
			Texas Great Plains Region.
		Upper Cretaceous	Montana sandstone. Colorado shales. Dakota sandstone.
	Cretaceous		
		Comanche	Washita group. Fredericksburg group. Trinity sands.
Mesozoic Age of reptiles			**North Atlantic Coastal Plain.**
	Jurassic	Lower Potomac	Arundel sands. Patuxent clays.
	Triassic	Newark	Brunswick sandstone. Lockatong shale. Stockton sandstone and shale.
			New York-Pennsylvania Region.
		Permian	Dunkard sandstone.
Age of acrogens	Carboniferous	Pennsylvanian	Monongebela sandstone and shale. Conemaugh sandstone and shale. Allegheny sandstone and shale. Pottsville—conglomerate.
		Mississippian	Manch Chunk shale. Pocono sandstone.
		Neodevonian	Chemung sandstone. Portage sandstone.
Age of fishes	Devonian	Mesodevonian	Hamilton shale. Marcellus limestone.
		Eodevonian	Corniferous limestone. Schoharie grits. Oreskony sandstone.
		Ontarian	Lower Heldenberg limestone. Salina sandstone. Niagara limestone. Clinton sandstone. Medina sandstone.
Paleozoic	Silurian		
		Champlanian	Hudson slate. Utica shale. Trenton limestone. Chozy limestone. Calciferous limestone.
		Potsdamian	Potsdam sandstone.
Age of invertebrates	Cambrian	Acadian	Acadia limestone.
		Georgian	Georgia slate.
			Lake Superior Region.
		Keweenawan	Keweenaw slate.
	Algonkian	Upper Huronian	Hanbury slate. Vulcan slate.
		Lower Huronian	Negaunee formation. Randville dolomite. Sturgeon quartzite.
Azoic	Archeon	Laurentian	

MINERAL PRODUCTS OF THE UNITED STATES.

Product.	1910.	
	Quantity.	Value.
METALS.		
Pig iron (spot value) ... long tons	27,303,567	$425,115,235
Silver, commercial value ... troy ounces	57,137,900	30,854,500
Gold, coining value ... do	4,657,018	96,269,100
Copper, value at New York City ... pounds	1,080,159,509	137,180,257
Lead, value at New York City ... short tons	372,227	32,755,976
Zinc, value at St. Louis ... do	252,479	27,267,732
Quicksilver, value at San Francisco ... flasks	20,601	958,153
Aluminum ... pounds	47,734,000	8,955,700
Antimonial lead ... short tons	14,069	1,338,090
Tin ... pounds	....	23,447
Platinum, value at New York City ... troy ounces	773	25,277
Total value of metals	....	760,743,467
NONMETALS (SPOT VALUE).		
Bituminous coal ... short tons	417,111,142	469,281,719
Pennsylvania anthracite ... long tons	75,433,246	160,275,302
Natural gas	....	70,756,158
Petroleum ... barrels	209,556,048	127,896,328
Peat	....	140,209
Clay products	....	170,115,974
Cement ... barrels	77,785,141	68,752,092
Lime ... short tons	3,481,780	13,894,962
Sand (molding, building, etc.) and gravel ... do	66,949,347	19,520,919
Sand-lime brick	....	1,169,153
Slate	....	6,236,759
Stone	....	76,520,584
Corundum and emery ... short tons	1,028	15,077
Garnet for abrasive purposes ... do	3,814	113,574
Grindstones	....	796,294
Infusorial earth and tripoli ... short tons	....	130,006
Millstones	....	28,217
Oilstones, etc	....	228,694
Pumice ... short tons	23,271	94,943
Arsenious oxide ... pounds	2,994,000	52,305
Borax (crude) ... short tons	42,357	1,201,842
Bromine ... pounds	245,437	41,684
Fluorspar ... short tons	69,427	430,196
Gypsum ... do	2,379,057	6,523,029
Lithium minerals ... do	....	(a)
Phosphate rock ... long tons	2,654,988	10,917,000
Pyrite ... do	238,154	958,608
Sulphur ... do	255,534	4,605,112
Salt ... barrels	30,305,656	7,900,344
Barytes (crude) ... short tons	42,975	121,746
Mineral paints ... do	85,685	2,174,735
Zinc oxide ... do	59,333	5,325,636
Asbestos ... do	3,693	68,357
Asphalt ... do	260,080	3,080,067
Bauxite ... long tons	148,932	716,258
Chromic iron ore ... do	205	2,729
Feldspar ... short tons	81,102	502,452
Fuller's earth ... do	32,822	293,709
Gems and precious stones	....	295,797
Glass sand ... short tons	1,461,089	1,516,711
Graphite (crystalline) ... pounds	5,590,592	295,733
Graphite (amorphous) ... short tons	35,945	81,443
Magnesite ... do	12,443	74,658
Manganese ore ... long tons	2,258	22,892
Manganiferous ore ... do	61,101	186,765
Mica (sheet) ... pounds	2,476,190	283,832
Mica (scrap) ... short tons	4,065	53,265
Mineral waters ... gallons sold	62,030,125	6,357,590
Quartz ... short tons	63,577	193,757
Talc and soapstone ... do	79,006	864,213
Talc, fibrous ... do	71,710	728,180
Thorium minerals (monazite) and zircon ... pounds	99,301	12,006
Titanium ore (rutile) ... do	566	44,480
Tungsten ore ... short tons	1,821	807,307
Uranium and vanadium minerals ... do	....	(a)
Total value of nonmetals	....	1 242,701,402
Total value of metals	....	760,743,467
Estimated value of mineral products unspecified	....	300,000
Grand total	....	2,003,744,869

a Included under unspecified.

VALUE OF IMPORTS FOR CONSUMPTION AND OF EXPORTS OF MINERAL PRODUCTS IN THE CALENDAR YEAR 1911.

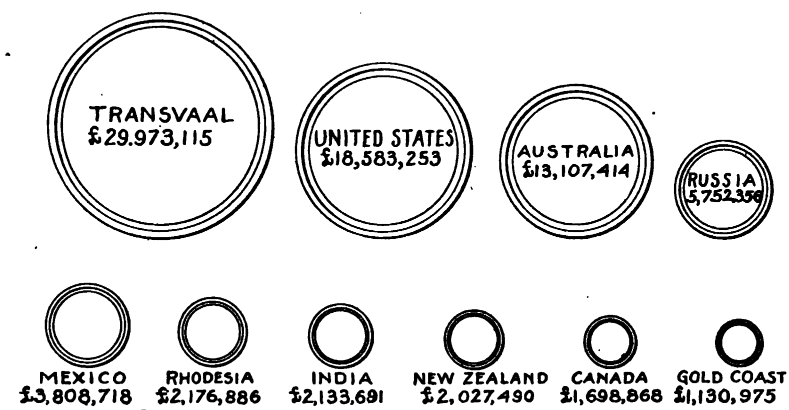
The imports of mineral products into the United States may be divided into metals and non-metals, the imports of the former amounting in 1911 to $105,629,981 and of the latter to $124,146,745, a total of $229,776,726 worth of mineral products imported into the United States in 1911. The imports of metals during the year were as follows: Aluminum salts, $56,833; antimony (metal, regulus and ore) $531,011; antimony salts, $54,426; bauxite, $164,301; bismuth, $311,771; cadmium, $3,870; chromic iron ore, $407,958; chromium salts, $3,508; cobalt (oxide, ore, and zaffer) $48,104; copper, in ore, matte, ingots, bars, manufactures, etc., $38,445,939; iron ore, $5,402,636; lead, in ore, base bullion, pigs, sheets, manufactures, etc., $631,654; manganese ore, $1,186,791; nickel, in ore, matte, oxide, etc., $4,050,030; platinum, $4,866,207; quicksilver, $251,386; tin, $43,346,394; tungsten ore, $85,887; type metal, $310,658; uranium salts and oxide, $14,106; zinc, in ore, sheets, dust, manufactures, etc., $408,273; iridium, osmium, palladium, and rhodium, $292,399. The imports of non-metals for the same period may be divided in similar fashion into: Alizarin, $996,794; aniline salts, $410,-193; arsenic sulphides, etc., $247,323; asbestos, $1,703,639; asphalt, $789,236; barytes, $58,726; barium compounds, $398,213; borax, $23,628; burrstones and millstones, $36,028; cement, hydraulic, $242,722; clay, $235,254; clay products, brick and tile, etc., $166,133; pottery, etc., $10,638,616; coal, anthracite, $12,550 and bituminous, $3,604,797; coal-tar products, $8,235,891; cobalt, $48,104; coke, $254,455; corundum and emery, $336,644; cryolite, $47,093; fertilizers, crude (guano, kainite, manure salts, phosphates, etc)., $10,387,588, potassium chloride, $7,651,693, potassium sulphate, $2,240,631 and sodium nitrate, $16,814,268; flint and flint pebbles, $236,158; fluorspar, $80,592; fuller's earth, $143,594; gems and precious stones, $40,820,-436; granite, $146,468; graphite, $1,495,729; grindstones, $123,727; gypsum, $450,806; hones, oilstones, whetstones, $54,379; infusorial earth and rotten stone, $35,665; kaolin or china clay $1,461,068; lead paints-litharge, orange mineral, red lead, white lead, $118,395; lime, $55,255; magnesite and magnesia, $1,224,987; marble and stone, $1,409,-930; mica, $502,163; mineral waters, $1,037,-485; monazite and thorium oxide, $60,542; ocher, $110,932; peat, $39,372; petroleum, $2,410,884; ozokerite and paraffin, $792,818; pumice, $118,977; pyrite, $3,788,803; shale, $375,030; sand and gravel, $147,268; sienna and umber, $59,334; slate, $8,367; sulphur, $552,836; talc, $88,050; thorium nitrate, $238,841; venetian red, $20,169; zinc oxide, $357,466.

The exports of mineral products from the United States again may be divided into metals and non-metals, the exports of the former amounting to $123,322,446 and of the latter to $190,807,641, or a total of $314,130,-087 worth of mineral products exported from the United States during the year 1911. The exports of metals for the year were as follows: Aluminum and manufactures, etc., $1,158,-603; copper, in ore, matte, ingots, bars manufactures, etc., $105,679,926; iron ore, $2,653,448; pig iron (including scrap) $2,916,-601; lead, in ore, base bullion, pigs, sheets, manufactures, etc., $680,419; nickel, in ore, matte, oxide, etc., $8,283,777; quicksilver, $13,995; zinc, in ore, pigs, sheets, dust, manufactures, $1,935,677. The exports of non-metallic products were as follows: Asphalt, $598,930; cement, hydraulic, $4,632,215; clay products, brick and tile, etc., $2,264,354, pottery, etc., $1,401,366; coal, anthracite, $18,093,285, bituminous, $34,499,989; coke, $3,215,990; fertilizers, phosphates, crude, $9,235,388; lime, $153,212; marble and stone, $1,810,182; petroleum, $105,922,848; paraffin and paraffin wax, $7,047,856; salt, $335,285; sulphur, $545,420, zinc oxide, $1,051,311.

CALENDAR OF EVENTS AND DISCOVERIES RELATIVE TO THE PRECIOUS METALS.

1530-1540.	Pillage of Peru.
1547-1548.	Discovery of Guanajuato silver mines in Mexico.
1577.	Discovery of gold in Brazil.
1670.	Discovery of placers of Garazua.
1680.	Discovery of placers of Minas-Geraes.
1704-1728.	Silver mines opened in Russia.
1743.	Discovery of gold in the Ural.
1848.	Discovery of Placers in California.
1848.	Introduction of Plattner's chlorination process at Reichenstein in Silesia.
1851.	Discovery of placers in Australia.
1853.	Introduction of hydraulic mining in California.
1853.	Maximum annual production of gold in California, amounting to $65,000,000 for the year.
1858.	Introduction of chlorination process at Grass Valley, California.
1866.	Invention of dynamite.
1886.	Opening of the "banket" reef of the Rand, South Africa.
1889.	Development of Manké's method of bessemerizing copper mattes and the successful refining of this impure copper by electricity.
1890.	Introduction of the cyanide process in the Rand, South Africa.
1897.	Discovery of placers in the Yukon.

The price per unit of the production (gold excepted, which is fixed by law) is based upon the average for the year 1910 of daily New York prices for the metals, as follows: Gold per fine ounce, $20.6718346255323; silver per fine ounce, $0.54; copper per pound, $0.127; lead per pound, $0.044; and zinc per pound, $0.054.



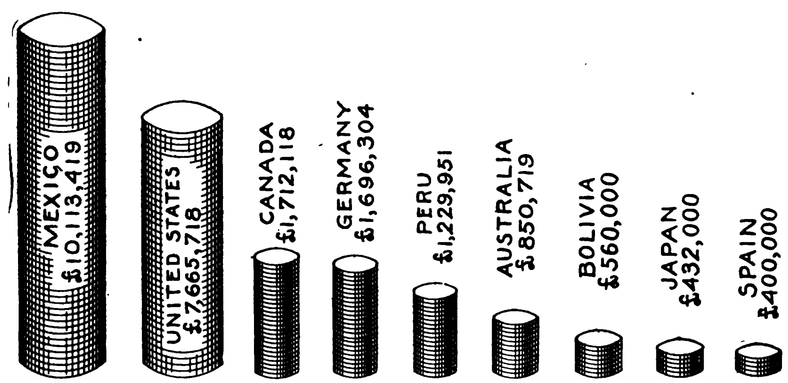
A YEAR'S PRODUCTION OF GOLD
(in pounds sterling)

Gold and Silver.

During the year 1880 there were 1,741,500 fine ounces of gold produced with a value of $36,000,000 and 30,318,700 fine ounces of silver, having a value of $34,717,000. In 1890 the 1,588,877 ounces of gold were valued at $32,845,000 and the 54,516,300 fine ounces of silver $57,242,000. For the year 1900 the 3,829,897 ounces of fine gold produced had a value of $79,171,000 and the 57,647,000 ounces of silver a value of $35,741,000. During the year 1911 there were 4,687,053 fine ounces of gold produced with a total value of $96,890,000 and 60,399,400 fine ounces of silver with a value of $32,615,700.

Platinum.

In 1911 the production of crude platinum was 628 troy ounces, valued at $18,137 as compared with 390 troy ounces in 1910 valued at $9,507. This entire output was recovered from placer mines in California and Oregon. The total quantity of refined platinum produced in domestic refineries in 1911 was about 29,140 fine ounces, of which only about 940 ounces, valued at $40,890, were derived from domestic sources of various kinds. The total imports for the year amounted to $4,866,207. The total world's production of platinum in 1911 amounted to 314,323 troy ounces.



A YEAR'S PRODUCTION OF SILVER
(in pounds sterling)

Lead.

The production of lead in 1911 was 406,148 short tons, valued at $36,553,320, as compared with 372,227 tons valued at $32,755,976 in 1910. The imports of lead were valued at $631,654 in 1911 against $755,092 in 1910. The exports were valued at 680,419 in 1911 against $614,158 in 1910. The imports of type metal were valued at $310,658 as against $485,493 in 1910. The United States ranks first in the production of lead with a production of 406,148 short tons; Spain ranks second with 189,155 tons; Germany third with 177,801 tons; Mexico fourth with 132,276 tons and Australia fifth with 109,789 tons.

Quicksilver.

The production of quicksilver in 1912 amounted to 25,064 flasks of 75 pounds each, valued at $1,053,941. California reported 20,524 flasks for the year; Nevada and Texas combined reported 4,540 flasks. The imports were valued at $39,920 in 1912 and the exports at $13,360.

Iron, Pig Iron and Steel.

The quantity of iron ore mined in the United States in 1912 amounted to 55,150,147 long tons, as compared with 43,876,552 long tons in 1911, an increase of 11,273,595 long tons, or 25.69 per cent. The quantity of iron ore marketed in 1912 amounted to 57,017,614 long tons, valued at $107,050,153, as compared with 41,092,447 long tons in 1911, valued at $86,716,575. This total production of 55,150,147 long tons consisted of the following ores: Hematite, 51,345,782 long tons; Brown ore, 1,614,486 long tons; Magnetite, 2,179,533 long tons; carbonate, 10,346 long tons. The rank of the principal iron-ore producing states with regard to both quantity and percentage of total production follows: Minnesota, 34,431,768 long tons, or 62.43%; Michigan, 11,191,430 long tons, 20.29%; Alabama, 4,563,603 long tons, 8.28%; New York, 1,216,672 long tons, 2.21%; Wisconsin, 860,600 long tons, 1.56%; all other states, 2,887,074 long tons, or 5.23%. The principal iron-ore producing region is the Lake Superior region, which alone in 1912 produced 46,368,878 long tons. There are six ranges included in the Lake Superior region, their production for the year 1912 being as follows: Marquette range (Mich.), 3,545,012 long tons; Menominee (Mich. and Wis.), 4,465,465 long tons; Gogebic (Mich. and Wis.), 3,926,632 long tons; Vermillion (Minn.), 1,457,273 long tons; Mesabi (Minn.), 32,604,756 long tons; Cuyuna (Minn.), 369,739 long tons.

The apparent consumption of iron-ore in the United States for intervals of ten years is as follows: 1890, 16,302,025 long tons; 1900, 26,722,583 long tons; 1910, 56,161,091 long tons; 1912, 58,031,118 long tons.

The imports of iron-ore in 1912 were valued at $6,499,690, as compared with $5,412,636 in 1911 and $7,832,225 in 1910. The exports in 1912 were valued at $3,537,289, as compared with $2,653,448 in 1911 and $2,474,165 in 1910.

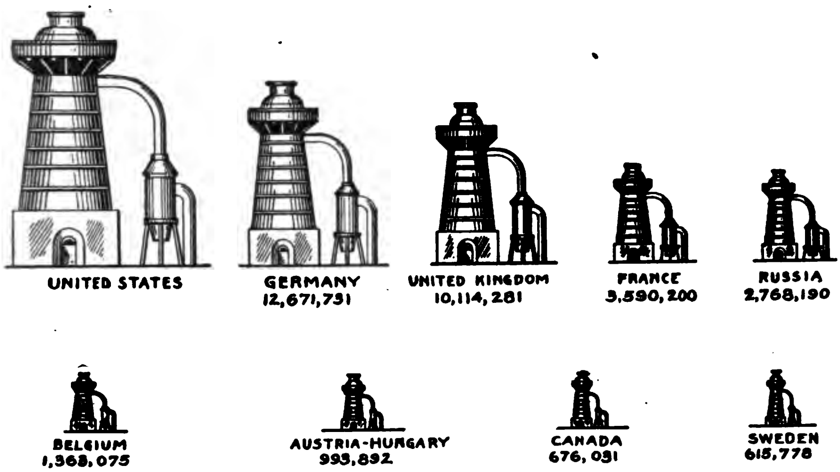
The production of pig iron in the United States in 1912 amounted to 29,726,937 long tons. The marketed production amounted to 30,180,969 long tons, valued at the furnaces at $420,563,388, as compared with 23,257,288 long tons in 1911, valued at $327,334,624. The whole number of furnaces in blast on December 31, 1912 was 313, against 231 in 1911; on that date 153 furnaces were idle or being rebuilt.

The production of all kinds of steel ingots and castings in 1912 amounted to 31,251,303 long tons and was made by the following processes: Bessemer, 10,327,901 long tons; Open hearth, 20,780,723; crucible and all other, 142,679 long tons.

WORLD'S PRODUCTION OF IRON ORE BY COUNTRIES.

Country.	1909	1910	1911	1912
North America:				
Canada [a]	239,324	231,623	187,807	156,250
Cuba [a]	936,132	1,462,498	1,163,714	1,397,797
Mexico	2	....	(b)	(b)
Newfoundland	1,004,050	1,108,762	(b)	(b)
United States	51,294,271	57,014,906	43,876,552	55,150,147
Europe:				
Austria-Hungary	4,503,768	4,592,572	(b)	(b)
Belgium	196,565	121,024	148,130	(b)
France	11,702,756	14,375,984	(b)	(b)
German Empire and Luxemburg	25,102,819	28,257,579	29,408,812	(b)
Greece	468,126	527,040	(b)	(b)
Italy	497,141	542,578	367,900	(b)
Norway	39,753	100,834	(b)	(b)
Portugal	....	3,307	(b)	(b)
Russia [c]	(b)	(b)	(b)	(b)
Spain	8,647,658	(b)	(b)	(b)
Sweden	3,824,862	5,465,234	(b)	(b)
United Kingdom	14,804,382	15,226,015	15,519,424	(b)
Asia:				
China	[d] 306,000	[e] 130,472	(b)	(b)
India	83,456	54,626	(b)	(b)
Japan [f]	(b)	(b)	(b)	(b)
Chosen (Korea)	90,569	104,627	(b)	(b)
Philippine Islands [g]	230	148	216	416
Africa:				
Algeria	876,969	1,048,228	(b)	(b)
Madagascar	(b)	(h)	(b)	(b)
Natal	....	50	(b)	(b)
Tunis	214,815	327,756	(b)	(b)
Australia	115,835	157,821	(b)	(b)

[a] Shipments. [c] Russia produced 2,581,121 long tons of pig iron in 1909, and 2,936,024 tons in 1910.
[b] Statistics not yet available. [d] Output of Tayeh mines. [e] Exports.
[f] Japan produced 53,338 long tons of pig iron in 1909, and 66,131 tons in 1910.
[g] Estimated by Bureau of Science of Philippine Islands for 1909 to 1911 from castings produced, and by U. S. Geological Survey for 1912 on same basis.
[h] Nearly 8 tons of iron (metal) produced in 1910.



IRON.
A YEAR'S PRODUCTION
(in tons.)

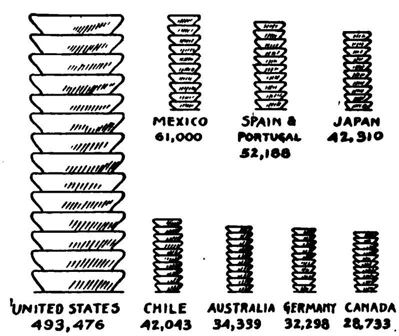
COPPER

The production of copper in 1911 was 1,097,232,749 pounds fine, valued at $137,154,092 as against 1,080,159,509 pounds, valued at $137,180,257, in 1910. The increase by decades in the production of copper is shown as follows: 1845, 224,000 pounds; 1855, 6,720,000 pounds; 1865, 19,040,000 pounds; 1875, 40,320,000 pounds; 1885, 165,875,766; 1895, 380,613,404 pounds; 1905, 888,784,267 pounds; 1911, 1,097,232,749 pounds. Considerable copper was reported by the mines, from ores mined primarily for other metals, and in all 263,647.58 fine ounces of gold and 16,759,638 fine ounces of silver were obtained from ores in which copper was the principal constituent.

Forms in which copper was cast in 1911 included wire bars, 731,029,349 pounds, or 50%; ingots and ingot bars, 409,786,682 pounds, or 29%; cakes, 143,716,125 pounds, or 10%; cathodes, 135,499,770 pounds, or 9%; other forms, 25,774,328 pounds, or 2%. It will be noted that the total, 1,445,806,254 pounds does not equal the refinery output of copper for 1911.

The imports in 1911 were valued at $38,445,939 as against $40,849,239 in 1910; $38,762,951, in 1909 and $29,664,129 in 1908. The exports in 1911 were valued at $105,679,926, as against $96,554,432 in 1910; $93,919,956, in 1908 and $91,809,675 in 1908.

The smelter production of copper in the world was 1,958,201,285 pounds in 1911, as compared with 1,903,297,003 pounds in 1910. In 1911 the smelter output of the United States was 56 per cent of the world's production, as compared with 56.76 per cent in 1910, 58 per cent in 1909 and 56.5 per cent in 1908. The following shows the principal copper producing countries of the world, for the year 1911. United States, 1,097,232,749 pounds; Mexico, 125,000,820 pounds; Japan, 123,237,140 pounds; Spain and Portugal, 116,843,800 pounds; Australia, 93,695,500 pounds; Chile, 66,358,460 pounds; Russia, 57,319,600 pounds; Peru, 57,099,140 pounds; Canada, 55,848,665 pounds; Germany, 49,162,580 pounds.

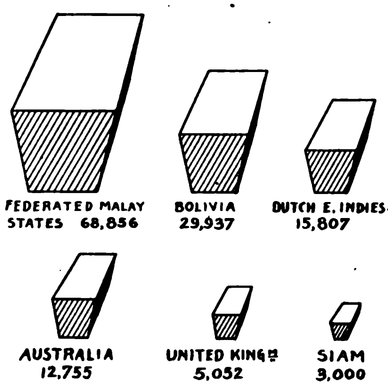


COPPER.
A YEAR'S PRODUCTION.
(in tons.)

The first illumination by gas in the United States was in the streets of Boston in 1823.

Tin.

In 1911 nominal outputs of tin as ore, concentrates and metal, were reported, valued at $56,635, and coming from Alaska and Texas. In 1910, the output of tin valued at $23,447 was reported from Alaska, North Carolina, South Dakota, and Texas. 92 tons of stream tin was dredged at Buck Creek, Alaska, in 1911. The imports in 1911 were valued at $43,346,394.



TIN.

A YEAR'S PRODUCTION.
(in tons.)

The Permanent Court of Arbitration.

This court, more popularly known as The Hague Tribunal, was constituted by virtue of the convention for the pacific regulation of international questions, concluded at The Hague, July 29, 1899. (Office, Prinsegracht 71, The Hague.)

Administrative Council.—President: The Minister for Foreign Affairs for Holland. Members: The diplomatic representatives of all the signatory powers accredited to The Hague.

Members of the Permanent Court of Arbitration.—Since the individuals themselves are constantly changing by ill health or death, we shall content ourselves by giving the signatory powers alone, letting it suffice to say that these powers appoint their most distinguished men, preferably lawyers, to the position. They are: Austria-Hungary, Belgium, Bulgaria, Denmark, France, Germany, Great Britain, Greece, Holland, Italy, Japan, Luxemburg, Mexico, Portugal, Roumania, Russia, Servia, Spain, Sweden, and Norway, Switzerland, and the United States.

Carnegie Peace Fund.

On December 14, 1910, Andrew Carnegie transferred to 27 trustees a fund of $10,000,000 in 5 per cent. first mortgage bonds, the revenue of which will be used to "hasten the abolition of international war" and to establish lasting world peace. The foundation is to be perpetual, and when the establishment of universal peace is attained the donor provides that the revenue shall be devoted to the banishment of the "next most degrading evil or evils."

COAL MINE ACCIDENTS IN NORTH AMERICAN MINES.

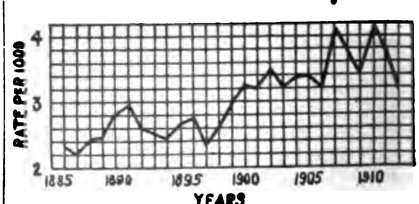
The loss of life in the production of anthracite and bituminous coal during 1912 involved the loss of 2,360 lives in and about the coal mines of the United States, as compared with 2,719 fatalities during 1911, a decrease of 539, or 13.2 per cent. The fatality rate for 1912 was 3.15 per 1,000 persons employed, as against 3.73 for 1912, a decrease of 0.58 per 1,000, or 15.5 per cent.

The loss of life based on actual numbers was greatest in the Pennsylvania anthracite region where 584 deaths occurred, followed by the bituminous region of Pennsylvania with 437, West Virginia with 359, Illinois with 159, Ohio with 133 and Alabama with 121; all others total 567.

Classified according to cause, the coal mine accidents of the United States during 1912 may be divided as follows: Underground, 2,119, or 89.79 per cent.; in shafts, 54 or 2.29 per cent.; on the surface, 187, or 7.92 per cent. Of the 2,119 killed underground, 1,151 were killed by falls of roof and coal; 362 by mine cars and mine locomotives; 301 by gas and coal dust explosions; 133 by explosives; 76 by electricity; and 96 by other causes not stated.

During the year 1911, 9,106 miners received serious injuries and 22,228 received slight injuries as a result of accidents. As in the case of deaths, the larger part of the serious injuries (43.57 per cent) was due to falls of roof and coal; the second largest cause was mine cars and locomotives, which accounted for 23.93 per cent. of the total serious injuries. Of those slightly injured, 37.64 per cent were injured from falls of roof and coal and 25.06 per cent by mine cars and locomotives.

The accompanying profile shows graphically the fluctuations in and gradual increase of the death rate during the period 1886 to 1912. The lowest rate of 2.23 per 1,000 in 1887 has never since been approached, with the exception of 1897, when it dropped to 2.33. Since 1900, the rate has never been below 3 per 1,000, and from this point on there has been a rapid and uniform increase.



INCREASE IN FATALITY RATE
1886-1912.

F. L. Hoffman in Coal Age.

COAL.

During the year 1910 there were 342,969,220 short tons of bituminous coal and 73,623,227 short tons of Pennsylvania anthracite, or a total of 416,592,447 short tons of coal loaded at the mines for shipment; 12,286,851 short tons of bituminous and 2,020,572 short tons of anthracite, or 14,307,423 tons in all sold to local trade or used by employees; 9,667,621 tons of bituminous and 8,841,437 tons of anthracite, or a total of 18,509,058 tons in all used at the mines for steam and heat; there were 52,187,450 short tons of bituminous coal made into coke during the year. Thus a total quantity of 417,111,142 short tons of bituminous coal and 84,485,236 tons of anthracite coal were produced during the year. The total value of the coal produced was $629,557,021, of which $469,281,719 was for the bituminous coal and $160,275,302 for the Pennsylvania anthracite. The average price per ton of bituminous coal was $1.12 per ton and for Pennsylvania anthracite $1.90 per ton. The average number of men employed in the mines was 725,030.

In 1911 there were 418,920,169 tons of coal loaded at the mines for shipment; 15,530,992 tons sold to local trade and used by employees; 19,552,840 tons used at the mines for steam and heat; and 42,217,167 made into coke; thus the total production of coal for the year was 496,221,168 short tons, of which amount 405,757,101 tons were bituminous coal and 90,464,067 tons were Pennsylvania anthracite. The total value, at an average price of $1.26 per ton, was $626,366,876. The average number of days the mines were active was 220 and the average number of employees 722,335.

During the year 1911 there were 172,585 men employed in the anthracite coal mines of Pennsylvania. They worked on an average of 246 days out of the year. The average production per man in 1911 was 524 short tons and the average daily tonnage per man was 2.13 tons. In the bituminous fields there were 549,750 men employed during the year 1911 and they worked on an average of 211 days. The average production per man in the bituminous mines was 738 tons and the average daily tonnage per man was 3.5 tons.

During the year 1911 there were 3,553,999 long tons of anthracite coal with a value of $18,093,285, and 13,878,754 long tons of bituminous, valued at $34,499,989, exported from the United States. The anthracite imports amounted to 2,463 long tons, valued at $12,550 and the bituminous and shale imports to 1,234,998 long tons, valued at $3,604,797.

Since 1899, the United States has ranked first in the coal producing nations of the world and Great Britain has ranked second. In 1911 the United States produced 496,221,168 short tons of coal; Great Britain, 304,518,927 tons; Germany, 258,223,763 tons; Austria-Hungary, 53,626,639 tons; France, 43,375,550 tons; Russia and Finland, 25,570,053; and Belgium, 25,490,842. The grand total production of coal in the world for 1911 amounted to 1,303,763,496 tons.

A summary of strikes in the coal mines of the United States shows that there were during the year 1911, 35,513 men idle, in the bituminous mines, for an average of 27 days. In the anthracite region operations were continued without serious trouble.

PER CENT. OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA DUE TO EACH CAUSE DURING A TEN-YEAR PERIOD.

Cause.	Fatal accidents.	
	Number.	Per cent of total.
Fall of coal	2,722	14.8
Fall of roof, slate, etc	5,823	31.8
Falling into shafts	369	2.0
Falling into slopes, manways, etc	125	.7
Mine cars	2,204	12.0
Outside cars	470	2.6
Motors	30	.2
Explosions:		
Dust or gas	2,571	14.0
Powder or dynamite	968	5.3
Blast	793	4.3
Other, not specified	292	1.6
Mining machinery	332	1.8
Mules	73	.4
Asphyxiation	271	1.5
Electrocution	193	1.0
Miscellaneous	1,105	6.0
Total	18,346	100.0

F. L. Hoffman in Bulletin of Bureau of Labor.

ACCIDENTS IN TRANSPORTATION OF EXPLOSIVES.

	HIGH EXPLOSIVES.		BLACK POWDER.		OTHER EXPLOSIVES.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1908	5	7	24	20	7	61
1909	....	....	6	3	....	4
1910	....	....	2	0	....	1
1911	....	3	....	....	1	2
Totals	5	10	32	23	8	68

RECAPITULATION.

	Total Killed.	Total Injured.
1908	36	88
1909	6	7
1910	2	1
1911	1	5
	45	101

ACCIDENTS IN MANUFACTURE, STORAGE OR USE OF EXPLOSIVES.

	HIGH EXPLOSIVES.		BLACK POWDER.		OTHER EXPLOSIVES.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1908	82	65	23	23	20	91
1909	122	84	17	25	10	41
1910	80	110	13	7	3	24
1911	53	25	40	31	3	7
Totals	337	284	93	86	36	163

RECAPITULATION.

	Total Killed.	Total Injured.
1908	125	179
1909	149	150
1910	96	141
1911	96	63
	466	533

Central Bureau of International Geodesy Established Upon the Telegraphberg, Near Potsdam.

This central bureau has existed since 1866. After the creation of the Prussian Geodetic Institute it was united with the latter in 1869. The object of the Geodetic Institute is to cultivate geodesy by scientific researches, to execute the astronomical and physical determinations which, joined with the geodetic determinations, may serve in the exploration of the surface of the earth, more particularly within Prussian territory.

The labors of the institute for the present bear more particularly upon the astronomical determinations of the vertical in longitude and latitude, as well as upon astronomical data upon as many points of the geodetic system as possible; moreover, upon the determination of zenithal distances for convenient points, also upon the determination of the density and force of gravitation; it devotes its attention, furthermore, to researches upon the mean level and variations in the sea-level; to the examining into the refraction of luminous rays by the atmosphere; finally, it is occupied with all theoretical and experimental researches which contribute to the examination of the surface and the geodesy of the country.

The Geodetic Institute is placed under the immediate supervision of the Minister of Ecclesiastical Affairs, Public Instruction, and Medical Affairs of Prussia.

The Academy of Sciences is the consulting organ of the Minister in all the important affairs of the Institute. Conformably to the conventions agreed upon between the contracting parties, the Institute performs the functions of a Central Bureau for international geodesy. The director of the bureau is at the same time director of the Institute.—Almanach de Gotha.

FATAL-ACCIDENT RATE IN THE COAL MINES OF NORTH AMERICA DURING A TEN-YEAR PERIOD, BY CAUSES.

Cause.	Fatal accidents. Number.	Fatal accidents. Rate per 10,000 employees.
Fall of coal	2,722	4.99
Fall of roof, slate, etc.	5,828	10.68
Falling into shafts	369	.68
Falling into slopes, manways, etc.	125	.23
Mine cars	2,204	4.04
Outside cars	470	.86
Motors	30	.05
Explosions:		
Dust or gas	2,571	4.71
Powder or dynamite	968	1.77
Blast	793	1.45
Other, not specified	292	.53
Mining machinery	332	.61
Mules	73	.13
Asphyxiation	271	.50
Electrocution	193	.35
Miscellaneous	1,105	2.02
Total	18,346	33.60

FATAL-ACCIDENT RATE PER 1,000 EMPLOYEES AND NUMBER OF LIVES LOST PER MILLION TONS MINED IN NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908.

State or Province.	Years considered.	Tons of coal produced.	Employees.	Fatal accidents. Number.	Fatal accidents. Per 1,000 employees.	Lives lost per 1,000,000 tons of coal mined.
Alabama	16	142,592,400	227,828	1,037	4.55	7.27
Arkansas	6	12,307,804	25,651	76	2.96	6.17
Colorado	25	117,663,271	188,054	1,074	5.71	9.13
Illinois	26	611,071,223	1,030,800	2,407	2.34	3.94
Indiana	24	146,490,472	245,115	547	2.23	3.73
Iowa	21	109,736,706	264,400	573	2.17	5.22
Kansas	22	86,096,365	184,895	415	2.24	4.82
Kentucky	22	112,218,992	218,866	375	1.71	3.34
Maryland	19	84,322,336	93,260	165	1.77	1.96
Michigan	10	13,081,027	23,356	68	2.91	5.20
Missouri	19	61,065,829	151,444	261	1.72	4.27
Montana	18	24,464,869	37,557	138	3.67	5.64
New Mexico	14	19,243,519	29,325	212	7.23	11.02
North Dakota	1	320,742	631	4	6.34	12.47
Ohio	34	467,312,293	863,812	1,845	2.14	3.95
Oklahoma	15	33,906,783	90,774	460	5.07	13.57
Pennsylvania:						
Anthracite	39	1,782,024,124	4,344,074	14,625	3.37	8.21
Bituminous	32	1,806,371,376	2,729,155	6,919	2.54	3.83
Tennessee	18	69,368,153	143,029	627	4.38	9.04
Utah	16	17,754,456	24,424	285	11.67	16.05
Washington	17	38,231,315	68,645	464	6.76	12.14
West Virginia	25	453,581,594	625,566	2,887	4.62	6.36
Wyoming	5	26,140,782	29,227	339	11.60	12.97
Total		6,235,366,431	11,639,897	35,803	3.08	5.74
British Columbia		22,106,271	68,698	497	7.23	22.48
Nova Scotia		90,512,879	236,998	720	3.04	7.95
Total		112,619,150	305,696	1,217	3.98	10.81
Grand total		6,347,985,581	11,945,593	37,020	3.10	5.83

F. L. Hoffman in Bulletin of Bureau of Labor.

CHRONOLOGICAL LIST OF PRINCIPAL COAL MINE DISASTERS IN NORTH AMERICA.

Year.	Date.	Name of mine, or locality, and State.	Lives lost.
1869	Sept.	Avondale, Pa.	179
1873		Drummond, Nova Scotia	73
1880	Mar. 29	Richhill, Mo.	23
1880		Fort Pitt, Nova Scotia	44
1883	Feb. 16	Braidwood, Ill.	69
1883	Nov. 23	Kettle Creek, Pa.	17
1884	Jan. 24	Crested Butte, Colo.	59
1884	Feb. 20	West Leisenring, Pa.	19
1884	Mar. 13	Pocahontas mine, W. Va.	114
1884		Johnstown mine, Pa.	14
1885		McBeam mine, Nova Scotia	13
1890	May 15	Ashley mine, Pa.	26
1890	June 16	Hill Farm mine, Pa.	31
1891	Jan. 27	Mammoth mine, Pa.	109
1891	Feb. 21	Spring Hill, Nova Scotia	125
1892	July 23	York Farm mine, Pa.	15
1893	Jan. 10	Como, Colo.	24
1894	Feb. 13	Gayland, Pa.	13
1896	Feb. 18	Vulcan mine, Colo.	49
1896	Mar. 23	Berwind mine, Pa.	13
1896	June 28	Twin Shaft mine, Pittston, Pa.	58
1399	June 16	Caledonia mine, Nova Scotia	11
1899	Dec. 10	Carbonado mine, Wash.	33
1899	Dec. 23	Brazella mine, Pa.	20
1899	Dec. 23	Sumner mine, Pa.	19
1899		North Carolina	22
1900	Mar. 6	Red Ash mine, W. Va.	46
1900	May 1	Schofield, Utah	200
1900	Nov. 2	Berryburg, W. Va.	15
1901	Feb. 15	Union mine No. 6, British Columbia	63
1901	Mar. 2	Diamond mine, Wyo.	28
1901	May 15	Chatham, W. Va.	10
1901	June 10	Port Royal mine, Pa.	20
1901	Sept. 30	Extension mine, British Columbia	16
1902	Jan. 14	Milby and Dowe mine, Ind. T.	10
1902	Jan. 25	Lost Creek mine, Iowa	22
1902	May 19	Fraterville, Tenn.	184
1902	May 22	Fernie mine, British Columbia	127

Year.	Date.	Name of mine, or locality, and State.	Lives lost.
1902	July 10	Johnstown, Pa.	112
1902	July 16	Park City, Utah	34
1902	Aug. 7	Bowen No. 3 mine, Colo.	16
1902	Sept. 15	Algoma, W. Va.	17
1903	Jan. 23	Primero, Colo.	24
1903	July 1	Hanna, Wyo.	235
1903	Nov. 21	Ferguson mine, Pa.	17
1904	Jan. 25	Harwick mine, Pa.	179
1904	Apr. 3	Zeigler, Ill.	53
1904	Apr. 23	Eleanora shaft, Pa.	13
1904	Dec. 1	Diamond mine, Mo.	18
1905	Jan. 4	Bluefields, W. Va.	22
1905	Jan. 18	Panther Creek, W. Va.	18
1905	Feb. 20	Virginia City, Ala.	108
1905	Feb. 27	Welch, W. Va.	15
1905	Mar. 18–19.	Rush Run, W. Va.	24
1905	Apr. 3	Zeigler, Ill.	47
1906	Jan. 4	Coaldale, W. Va.	22
1906	Jan. 18	Detroit and Kanawha, W. Va.	18
1906	Feb. 8	Parrall mine, W. Va.	23
1906	Mar. 22	Century, W. Va.	23
1906	Apr. 21	Trinidad, Colo.	23
1907	Jan. 23	Primero, Colo.	20
1907	Jan. 26	Penco, mine, W. Va.	12
1907	Jan. 29	Stuart, W. Va.	85
1907	Feb. 4	Thomas mine, W. Va.	25
1907	May 1	Whipple mine, W. Va.	16
1907	Dec. 1	Naomi mine, Pa.	34
1907	Dec. 6	Monongah No. 8 mine, W. Va.	359
1907	Dec. 19	Darr mine, Pa.	239
1908	Jan. 12	Lick Branch, W. Va.	105
1908	May 1	Mount Lookout, Pa.	12
1908	Aug. 26	Halleyville, Okla.	29
1908	Nov. 28	Mariana mine, Pa.	154
1909	Jan. 10	Lieter mine, Ill.	26
1909	Nov. 13	St. Paul mine, Cherry, Ill.	266
1909	Dec. 28	Lick Branch, W. Va.	51
1910	Jan. 31	Primero, Colo.	75
1910	Feb. 1	Drakesburg, Ky.	30
1910	Apr. 20	Mulga, Ala.	40
1910	Apr. 21	Amsterdam mine, Ohio.	16
1910	May 5	Palos, Ala.	83

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LATEST COAL MINE DISASTERS.

Year	Date	Name of Mine, or locality and State	Lives lost
1910	Oct. 3	Roslyn mine, Wash.	10
1910	Oct. 8	Starkville, Colo.	56
1910	Nov. 6	Lawson mine, Wash.	16
1910	Nov. 8	Victor American, Colo.	79
1910	Nov. 25.	Providence, Ky.	10
1910	Dec. 14.	Leyden, Colo.	10
1910	Dec. 31	Lick Fork mine, W. Va.	10
1911	Feb. 9	Cokedale mine, Colo.	17
1911	Apr. 7	Prince-Pancoast mine, Pa.	73
1911	Apr. 8	Banner mine, Ala.	128

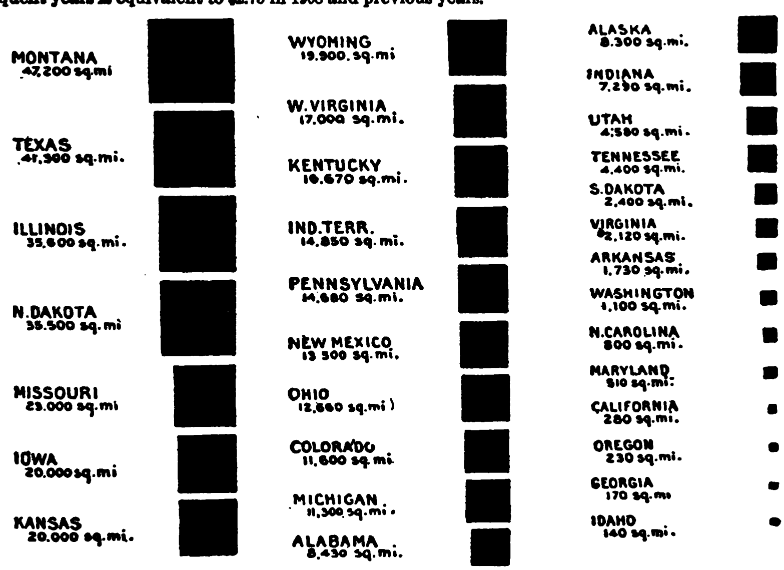
Year.	Date	Name of mine, or locality and State	Lives lost
1911	Apr. 24	Elk Garden, W. Va.	23
1911	July 13	Sykesville, Pa.	21
1911	Nov. 18.	Bottom Creek mine, W. Va.	18
1911	Dec. 9	Cross Mountain mine, Tenn.	84
1912	Mar. 20.	San Boise mine, Okla.	73
1912	Mar. 26.	Jed, W. Va.	82
1912	June 18	Hastings, Colo.	12
1912	July 24	Superba mine, Pa.	15
1912	Aug. 13	Abernant, Ala.	18
1913	May 19	Belle Valley, Ohio.	15

PRICE OF COAL.

[Sources: Anthracite, for shipment beyond the Delaware Capes, American Iron and Steel Association; bituminous, Saward's Coal Trade Journal.]

Calendar year.	Anthracite.	Bituminous.	Calendar year.	Anthracite.	Bituminous.	Calendar year.	Anthracite.	Bituminous.
	Dollars.	*Dollars.*		*Dollars.*	*Dollars.*		*Dollars.*	*Dollars.*
1855	4.49	3.89½	1874	4.55	4.50	1893	3.90	[1]2.40
1856	4.11	3.75	1875	4.39	4.35	1894	3.90	[1]2.25
1857	3.87	4.28	1876	3.87	3.87	1895	3.50	[1]2.00
1858	3.43	3.70	1877	2.59	3.15	1896	3.50	[2]2.28
1859	3.25	3.63	1878	3.22	2.86	1897	3.50	[2]1.80
1860	3.40	3.49	1879	2.70	2.79	1898	3.50	[2]1.60
1861	3.39	3.44	1880	4.53	3.75	1899	3.75	[2]2.00
1862	4.14	4.23	1881	4.53	3.75	1900	3.47	2.50
1863	6.06	5.57	1882	4.61	3.50	1901	3.80	2.50
1864	8.39	6.84	1883	4.54	2.90	1902[3]	4.50	2.50
1865	7.86	7.57	1884	4.42	2.50	1903	4.50	3.35
1866	5.80	5.94	1885	4.10	2.25	1904	4.50	2.25
1867	4.37	4.97	1886	4.00	2.10	1905	4.50	2.60
1868	3.86	4.71	1887	4.05	3.45	1906	4.50	2.75
1869	5.31	4.97	1888	4.21	[1]2.60	1907	[4]4.50	2.80
1870	4.39	4.72	1889	4.04	[1]2.60	1908	[4]4.50	[5]2.70
1871	4.46	4.72	1890	3.92½	[1]2.60	1909	[4]4.50	[5]2.60
1872	3.74	4.66	1891	3.85	[1]2.60	1910	[4]4.50	[6]2.60
1873	4.27	4.84	1892	3.97½	[1]2.50	1911	[4]4.50	[6]2.60

[1] The price on board fixed at Baltimore by the Seaboard Coal Association.
[2] Price of soft-coal pool.
[3] Owing to unusual conditions in the coal market the association price for 1902 is not a correct guide as to the actual selling price, Clearfield coal selling as high as $7 at the mines and as high as $9 in New York Harbor. Unsettled conditions lasted until Mar. 1, 1903, or nearly so; then, on Apr. 1, prices were made $3.30 at Baltimore; later on in the year this price was discounted from 10 to 15 per cent.
[4] Shipments nominal. No sales made in 1909, 1910, or 1911.
[5] Cumberland coal now includes "thin seam" as well as "big vein" coal, the former selling about 25 cents per ton lower than the latter.
[6] Freight on "big vein" coal to Baltimore having been reduced 15 cents, $2.60 in 1909 and subsequent years is equivalent to $2.75 in 1908 and previous years.



COAL RESERVES BY STATES.

Coke.

The total production of coke in 1912 amounted to 43,983,599 short tons (11,115,164 tons from retort ovens), valued at $111,736,-696, and the average price paid per ton for the same period was $2.10. The average output from the by-product ovens in 1912 was 2,133 short tons per oven and from the beehive ovens 484 short tons. The imports of coke were valued at $488,398 in 1912 and the exports (912,576 short tons) at $3,002,742.

The value and quantity of products obtained in the manufacture of coke in retort ovens were as follows: Gas, 54,491,248 thousand cubic feet, valued at $4,650,517; tar, 94,306,583 gallons, valued at $2,310,900; ammonia, sulphate or reduced to equivalent sulphate, 95,275,545 pounds, valued at $3,-649,144; ammonia liquor, 5,502,403 gallons, valued at $735,120; anhydrous ammonia, 3,144,014 gallons, valued at $4,114,449; other by-products valued at $610,552, thus making the total value of the by-products of coke $16,070,682. The value of the coke manufactured in retort ovens was $42,632,930 and the total value of all the products obtained in the manufacture of coke by this process was $58,703,612.

Natural Gas.

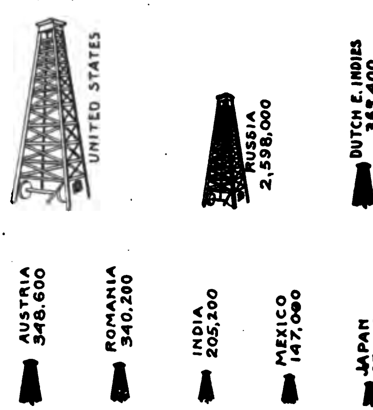
The value of natural gas produced in 1911 was $74,127,534, as compared with $70,756,-158 in 1910. No imports of natural gas were reported for 1911. Pennsylvania consumed more natural gas than any other state in the Union, the amount being 154,475,376 thousand cubic feet, valued at $23,446,001; Ohio ranked second with 112,123,029 thousand cubic feet, valued at $22,792,270; Kansas came next with 77,861,143 thousand cubic feet, valued at $9,493,701, and West Virginia fourth with 80,868,645 thousand cubic feet, valued at $6,240,152. During the year 1911 there were 508,353,241 thousand cubic feet of natural gas consumed having a total value of $74,127,534. The value of all the natural gas produced in the United States for the year 1911 was $74,127,534 and of the crude petroleum, $134,044,752, thus making the value of natural gas and crude petroleum, $208,172,286. There were 28,428 productive wells on Dec. 31, 1911.

Production and Value of Petroleum. Well Records, and Acreage.

In the year 1911 the total production of petroleum in the United States amounted to 220,449,391 barrels, the total value being $134,044,752, or an average price per barrel of $0.608. On January 1, 1910 there were 149,402 productive wells in the United States, and on Dec. 31, there were 152,687. The average daily production (in barrels) per well amounted to 3.8. The total acreage in wells in the United States in 1911 amounted to 8,322,862. Imports for the year amounted to $2,410,884 and exports to $105,922,848. The total production of the world was 345,512,185 barrels, of which the United States produced 63.8 per cent, or almost two-thirds.

Petroleum Refining.

The products of the petroleum-refining industry, statistics for which are presented below, aggregated $236,997,659 in value in 1909 as compared with $123,929,384 in 1899, the increase during the decade being 91.2 per cent. This conforms closely with the increase in the cost of crude petroleum used which was 89.4 per cent. The crude petroleum used increased in quantity from 52,011,005 barrels of 42 gallons in 1899 to 120,775,439 barrels in 1909, or 132.2 per cent., and the refined-oil products aggregated 40,290,985 barrels of 50 gallons in 1899 and 89,082,810 barrels in 1909, an increase of 136.2 per cent. for the decade. The total amount of crude petroleum used for refining purposes was 120,775,439 barrels of 42 gallons each, valued at $152,307,040. The products of the refining process were as follows: Illuminating oils, 33,495,798 barrels (50 gallons), value, $94,547,010; fuel oils (including gas oils), 34,034,577 barrels, value $36,462,883; lubricating oils, 10,745,885 barrels, valued at $38,884,236; naphtha and gasoline (including gas naphtha), 10,806,550 barrels, value $39,771,959; paraffin wax, 946,830 barrels, value $9,388,812; oil asphaltum, 233,328 short tons, value $2,724,752; residuum or tar, 1,787,008 barrels, value $2,215,623; greases (lubricating, etc.), 138,302 barrels, value $1,567,647; coke and black naphtha, value $507,695; sludge acid, 133,215 short tons, value $402,295; and all other products, value $10,524,747.



PETROLEUM.
A YEAR'S PRODUCTION
(in thousands of gallons.)

Aluminum.

The consumption of aluminum in 1911 was 46,125,000 pounds, valued at $8,084,000, as against 7,150,000 pounds in 1900, 61,281 pounds in 1890 and 83 pounds in 1883. The imports of aluminum salts in 1911 were valued at $56,833, and the exports of manufacturers of aluminum at $1,158,603.

WORLD'S PRODUCTION OF CRUDE PETROLEUM, 1907-1911, BY COUNTRIES.

Country.	1907	1908	1909	1910	1911			
					Rank.	Barrels.	Metric tons.	Per cent of total production.
United States	166,095,335	178,527,355	183,170,874	209,557,248	1	220,449,391	29,393,252	63.80
Russia	61,850,734	62,186,447	65,970,350	70,336,574	2	66,183,691	9,066,259	19.16
Mexico	1,000,000	3,481,410	2,488,742	3,332,807	3	14,051,643	1,873,552	4.07
Dutch East Indies	9,982,597	10,283,357	11,041,852	11,030,620	4	12,172,949	1,670,668	3.52
Roumania	8,118,207	8,252,157	9,327,278	9,723,806	5	11,101,878	1,544,072	3.21
Galicia	8,455,841	12,612,295	14,932,799	12,673,688	6	10,485,726	1,458,275	3.04
India	4,344,162	5,047,038	6,676,517	6,137,990	7	6,451,203	897,184	1.87
Japan	2,010,639	2,070,145	1,889,563	1,930,661	8	1,658,903	221,187	.48
Peru	756,226	1,011,180	1,316,118	1,330,105	9	1,398,036	186,405	.40
Germany	756,631	1,009,278	1,018,837	1,032,522	10	995,764	140,000	.29
Canada	788,872	527,987	420,755	315,895	11	291,096	38,813	.08
Italy	59,875	50,966	42,388	42,388	12	a 71,905	10,000	.02
Other	a 30,000	a 30,000	a 30,000	a 30,000	....	a 200,000	26,667	.06
Total	264,249,119	285,089,615	298,326,073	327,474,304	....	345,512,185	46,526,334	100.00

a Estimated.

Quantity of Petroleum Produced in, and Quantities and Value of Petroleum Products Exported from, the United States.

The total exports of petroleum from the United States during the year 1911 amounted to 1,768,731,699 gallons, valued at $105,922,848. The exports of mineral, crude (including all natural oils, without regard to gravity) oils was 201,843,355 gallons, valued at $6,165,403; the exports of mineral, refined, or manufactured naphtha, benzine, gasoline, etc., totaling 137,294,606 gallons was valued at $11,482,761; the exports of mineral, refined or manufactured illuminating oils was 1,112,295,006 gallons, valued at $61,055,095; the exports of mineral, refined or manufactured lubricating oils (heavy paraffin, etc.), amounting to 183,319,645 gallons was valued at $23,337,126; and the exports of residuum (tar, pitch, and all other, from which the light bodies have been distilled) amounting to 133,979,087 gallons was valued at $3,882,463.

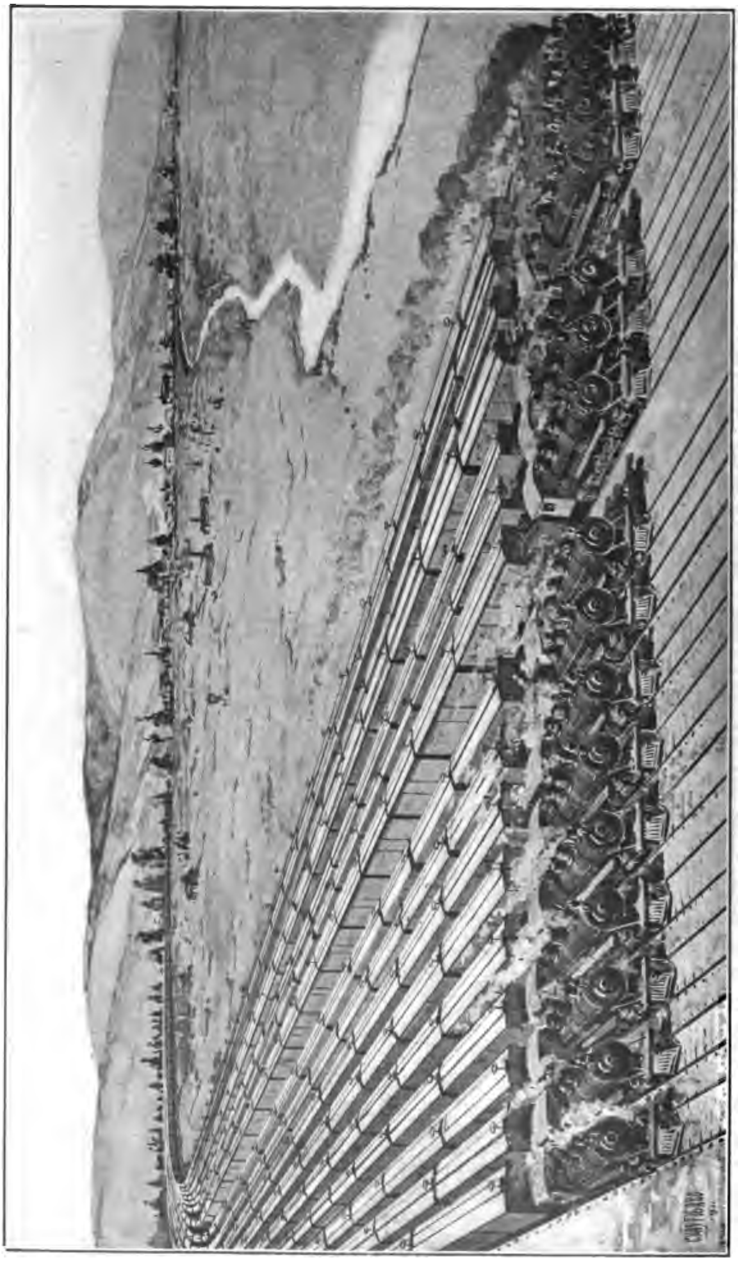
Cement.

The quantity of Portland, natural and puzzolano cement produced in the United States during 1912 was 83,351,191 barrels, valued at $67,461,513. As compared with 1911, when the production was 79,547,958 barrels, valued at $66,705,136, the year 1912 showed an increase of 3,803,233 barrels, or 4.78 per cent in quantity, and an increase of $756,377 or 1.13 per cent in value. In 1912 the quantity of Portland cement produced was 82,438,096 barrels, valued at $67,016,928; the production of natural cement amounted to 821,231, valued at $367,222; and the production of puzzolano cement amounted to 91,864 barrels, valued at $77,363.

From 1818 when the first natural cement was used, 300,000 barrels, up to the year 1890, when the maximum amount 9,868,179 barrels was used, the consumption of natural cement constantly grew. Since 1899, however, the consumption has gradually decreased, until in 1912 the production only amounted to 821,231 barrels. The future of natural cement depends entirely upon means of improvement in the manufacture of the cement, whereby it may be brought nearer the specification for the high-grade Portland cement. The decline in the use of natural cement has been due principally to the greater tensile strength of Portland cement.

During the year 1912 the domestic consumption of Portland cement amounted to 80,865,527 barrels, which figure is arrived at as follows: To the shipments, 85,012,556 barrels, add the imports, 68,503 barrels, and subtract the exports, 4,215,532, leaving as the apparent consumption, 80,865,527 barrels.

The total production of pig-iron for the year 1912 was 29,726,937 tons against 23,649,547 tons in 1911. On June 30, 1912, there were 266 furnaces in blast and on December 31 there were 313. The total number of furnaces on December 31, 1912, was 466.



PART OF THE 74,000,000 BARRELS OF CEMENT MANUFACTURED IN 1910 AND WHERE IT WENT.

To Panama Canal in 1910: 2,100,000 barrels of cement, which would fill 9 trains each 10 miles in length and consisting of 1,400 cars.
To Florida-Key West Railroad: 800,000 barrels of cement. Three trains each over 10 miles long.
To Ashokan Dam: 1,000,000 barrels. Four trains over 10 miles long.

 1910-$0.75 1900-$1.00 1890-$2.00 1880-$3.00

CEMENT MARKET AND ITS GROWTH IN THE PAST 30 YEARS.

Portland Cement manufactured in 1910 would fill a barrel 980 feet high—just short of the Eiffel Tower. Note the enormous increase of cement production by decades and the corresponding drop in price per barrel at the mill.

Clay Products.

The value of all clay products in 1911 was $162,236,181; the brick and tile products being valued at $127,717,621 and the pottery at $34,518,560. The various kinds of clay together with their amount and value were as follows: Kaolin, 27,400 short tons, valued at $221,045; paper clay, 99,265 short tons, valued at $454,435; slip clay, 8,393 short tons, valued at $16,770; ball clay, 65,072 short tons, valued at $220,710; fire clay, 1,526,921 short tons, valued at $2,112,827; stoneware clay, 151,384 short tons, valued at $165,751; brick clay, 142,020 short tons, valued at $123,900; miscellaneous, 162,243 short tons, valued at $165,325.

The imports of pottery in 1911 amounted to $10,638,616; the imports of brick, fire brick, tile, etc., were valued at $10,804,749. The exports of brick in 1911 were valued at $2,264,354, and the exports of pottery at $1,401,366. The imports of kaolin or china clay in 1911 were valued at $1,461,068, and the imports of other clays amounted to $235,254.

Sand and Gravel.

During the year 1912 there were 1,465,386 short tons of glass sand, valued at $1,430,471, produced in the United States, 4,484,593 short tons of molding sand, valued at $2,718-,398; 23,632,157 tons of building sand, valued at $7,904,321; 1,397,667 tons of grinding and polishing sand, valued at $667,750; 455,454 tons of fire sand, valued at $318,742; 1,288,486 tons of engine sand, valued at $428,928; 51,446 tons of furnace sand, valued at $27,258; 1,778,530 tons of paving sand, valued at $670,680; other sands amounting to 3,986,288 tons, valued at $1,177,065; and 29,768,510 tons of gravel, valued at $7,737,942. Thus the total quantity of sand and gravel produced in the United States during the year 1912 amounted to 68,318,988 short tons, valued at $23,081,555. The imports of sand for the same period amounted to $141,690.

Salt and Bromine.

The production of salt in the United States (including Hawaii and Porto Rico) in 1912 was 33,324,808 barrels, of 280 pounds each, or 4,665,473 short tons, valued at $9,402,772. The production of brine salt in the United States, for the same period, by grades was as follows: Table and Dairy, 3,961,450 barrels; common fine, 6,021,052 barrels; common coarse, 2,753,375 barrels; packers', 751,551 barrels; coarse solar, 1,105,935 barrels; other grades, 231,063 barrels and brine, 11,408,623 barrels, making the total production of brine salt 26,233,059 barrels, valued at $7,704,943. The quantity of rock salt mined in the United States during 1912 was 992,846 short tons, valued at $1,697,829.

The imports of salt during the year amounted to 998,664 barrels, valued at $370,648 and the exports to 445,785 barrels, valued at $418,525, leaving an excess of imports over exports of 552,879 barrels. This added to the domestic production makes the apparent consumption of salt for the year 33,877,687.

The production of bromine in 1912 amounted to 647,200 pounds, valued at $136,201.

Slate.

The production of slate in 1912 was valued at $6,043,318. The imports of slate for the same period were valued at $14,768; the exports were not reported separately from that of other varieties of stone.

Lime.

The production of lime in 1912 was 3,529,462 short tons, valued at $13,970,114. The average price per ton was $3.96. The imports in 1912 amounted to 4,268 short tons, valued at $48,153 and the exports amounted to 260,669 barrels, valued at $199,515.

Stone.

The value of all kinds of stone produced in the United States in 1911 amounted to $76,966,698. The imports of marble and stone were valued at $1,556,398 and the exports at $1,810,182. The value of the granite produced in the United States during 1911 was $21,391,878; trap rock, $6,399,622; sandstone, $7,730,868; bluestone, $1,876,473; limestone, $33,897,362; marble, $7,546,718.

Sulphur and Pyrite.

The domestic production of sulphur in 1912 was 303,472 long tons, valued at $5,256,422. The production of pyrite in 1912 was 350,928 long tons, valued at $1,334,259. The imports of sulphur amounted to 29,927 long tons, valued at $583,974, and the exports to 57,736, valued at $1,076,414. The imports of pyrite for 1912 were valued at $3,841,683.

Pigments.

Barytes.—The production of crude barytes in 1911 was 38,445 short tons, valued a $122,792. The imports of barytes were valued at $58,726 and the imports of barium compounds at $398,213.

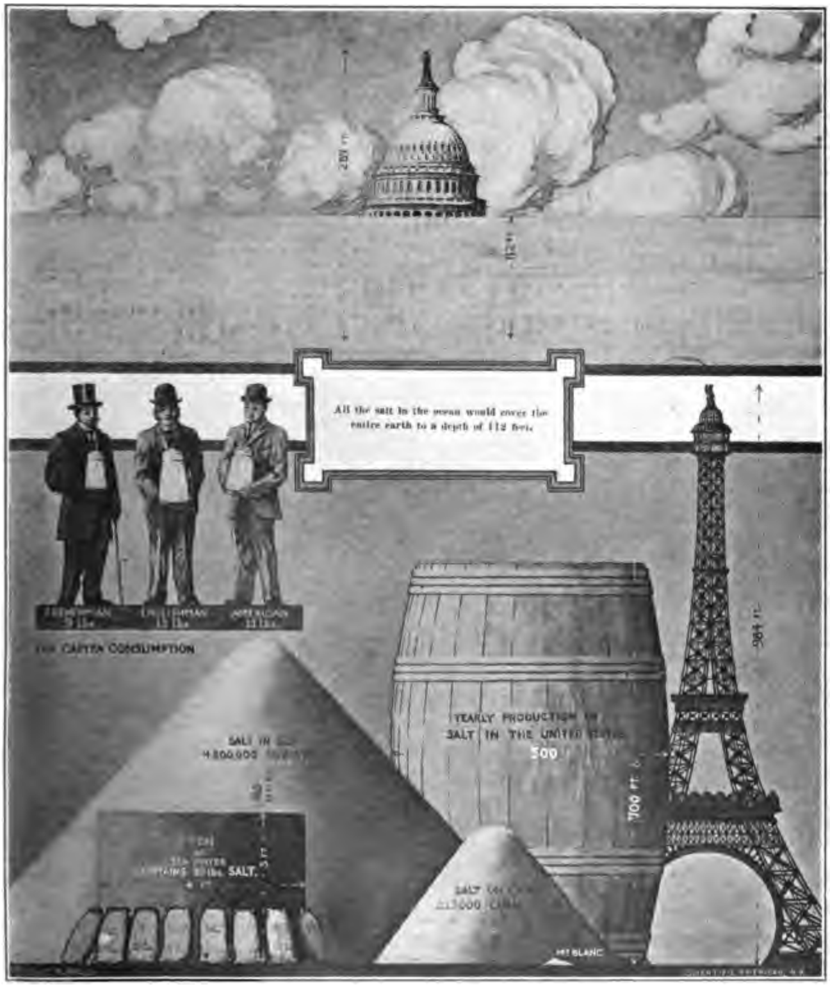
Mineral Paints.—The commercial production of mineral paints in 1911 amounted to 143,350 short tons, valued at $7,842,583. This includes the natural mineral pigments, pigments made directly from ores, and chemically manufactured pigments.

Asphalt.

During the year 1912 the total production of asphalt and bituminous rock amounted to 449,510 short tons, valued at $4,620,731 and was divided into the following varieties; Bituminous rock, 53,041 short tons, valued at $152,675; refined bitumin, 22,852 short tons, valued at $241,772; maltha, 474 short tons, valued $3,518; wurtsilite (elaterite), 8,452 short tons, valued at $115,620; gilsonite, 31,478 short tons, valued at $573,069; oil asphalt, 333,213 short tons, valued at $3,534,-077. The mports of asphalt in 1912 amounted to 218,328 short tons, valued at $921,145, and the exports to 1,170,882 short tons.

Nickel.

No production of nickel ore, as such, was reported in the United States during 1911 but 445 tons of metallic nickel, valued at about $127,000, were saved as by-products. The imports during 1911 were valued at $4,050,030, and the exports at $8,283,777.



MAGNITUDE OF THE SALT INDUSTRY.

Salt in sea and on land.—Yearly production in the United States. 157,267,544 tons of sodium are annually poured into the sea. Of this amount, 77¾ per cent. is common salt.

GEMS AND PRECIOUS STONES.

Production of precious stones in the United States in 1907, 1908, 1909, and 1910.

	Value.				Remarks.
	1907	1908	1909	1910	
Agates, chalcedony, etc., moonstones, etc., onyx.	$650	$1,125	$750	$2,268	About 1,150 pounds; California, Colorado, Montana, and Wyoming.
Amethyst	850	210	190		No production reported.
Azurmalachite, malachite, etc.	250	5,450	2,000	550	475 pounds; Arizona and Nevada.
Benitoite	1,500	3,638	500		No production reported.
Beryl, aquamarine, blue, pink, etc.	6,435	7,485	1,660	5,545	About 30 pounds rough and selected.
Californite	[a] 25,000		[a] 18,000	[a] 8,000	1,500 pounds; California; not sold.
Catlinite	25				No production reported.
Chiastolite	20				Do.
Chlorastrolite		25	2,400	[a] 2,000	1,250 pounds; Michigan.
Chrysocolla	150	600	300		No production reported.
Chrysoprase	[a] 46,500	[a] 48,225	[a] 84,800	[a] 9,000	1,700 pounds; California.
Cyanite	100				No production reported.
Diamond	[a] 2,800	[a] 2,100	2,033	[a] 1,400	208 stones; Arkansas and California.
Diopside		120			No production reported.
Emerald	[a] 1,320		[a] 300	[a] 700	North Carolina.
Epidote	60		15		No production reported.
Feldspar, sunstone, amazon stone, etc.	1,110	2,850	[a] 2,700	2,510	4,128 pounds; Colorado and California.
Garnet, hyacinth, pyrope, almandine, rhodolite.	6,460	13,100	1,650	3,100	151 pounds; California, Arizona, and Colorado.
Gold quartz	1,000	1,010		1,000	Colorado and California.
Jasper	675		100	475	500 pounds; Colorado and California.
Opal	180	50	200	270	Nevada.
Peridot	1,300	1,300	300		No production reported.
Petrified wood	325				Do.
Phenacite	25	95	50	50	Colorado.
Prase				100	50 pounds; Oregon.
Pyrite	400				No production reported.
Quartz, rock crystal, smoky quartz, rutilated, etc.	2,580	3,595	2,689	1,385	1,753 pounds; Colorado, Maine, Vermont, California, and Texas.
Rose quartz	6,375	568	2,970	2,537	25,025 pounds; South Dakota and California.
Rhodocrosite	150				No production reported.
Rhodonite		1,250	125	[a] 6,200	3,200 pounds; Montana and California.
Ruby	2,000				No production reported.
Rutile	200		25		Do.
Sapphire	[a] 229,800	[a] 58,397	[a] 44,998	52,983	1,062,000 carats; Montana and Indiana.
Smithsonite	800	[a] 1,200	300		No production reported.
Spodumene, kunzite, hiddenite.	14,500	[a] 6,000	15,150	33,000	120 pounds; California.
Thompsonite		35	100	610	About 50 pounds; Michigan, Minnesota, and New Jersey.
Topaz	2,300	4,435	512	884	75 pounds; California, Colorado, and Texas.
Tourmaline	[a] 84,120	[a] 90,000	[a] 133,192	[a] 46,500	1,548 pounds; California and Maine.
Turquoise and matrix	23,840	[a] 147,950	[a] 179,273	[a] 85,900	16,886 pounds; Nevada, New Mexico, Arizona, and Colorado.
Variscite, amatrice, utahlite	7,500	14,250	35,938	[a] 26,125	5,377 pounds; Utah and Nevada.
Miscellaneous gems			1,060	2,755	Datolite, obsidian, fossil coral, and ornamental stones with trade names.
Total	471,300	415,063	534,380	295,797	

[a] Estimated or partly so.

Miscellaneous.

Asbestos.—The asbestos commercially produced in the United States in 1912 was obtained from deposits in Georgia, and Vermont, with small quantities from Idaho and Wyoming. The total commercial production in 1912 was 4,403 short tons, valued at $87,959. The imports for consumption were valued at $1,819,771 in 1912.

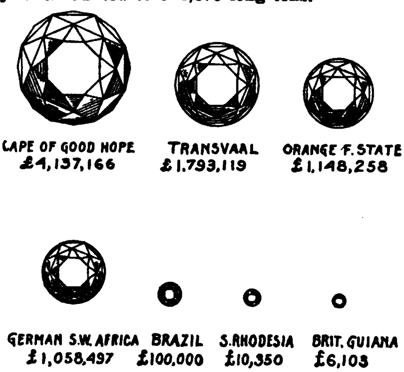
Graphite.—The commercial production of crystalline graphite in 1912 amounted to 3,543,771 pounds, valued at $187,689. The production of amorphous graphite in 1912 was 673 short tons, valued at $19,344. The production of artificial graphite was 12,896,347 pounds, valued at $830,193, the average price per pound being $6.44. The imports of graphite in 1912 were valued at $1,709,337.

Mica.—The total production of mica in 1912 was 845,483 pounds of sheet mica, valued at $282,823, and 3,226 short tons of scrap mica, valued at $49,073. The imports of mica in 1912 were valued at $748,973.

Mineral waters.—The total production of mineral waters in 1911 was 63,923,119 gallons, valued at $6,837,888. The imports of mineral waters in 1911 amounted to $1,037,485.

During the year 1911 there were 732 springs in the United States reporting sales of mineral waters. They sold 63,923,119 gallons of mineral waters, valued at $6,837,888. Each year has shown a growth in the production of what is known as "soft drinks." In all 6,595,757 gallons of water were used in the manufacture of soft drinks. Wisconsin leads all the states in the amount of water used, using 2,037,258 gallons, or about one-third of all the mineral waters used in the manufacture of soft drinks in the United States.

The total imports of iron ore into the United States in 1910 amounted to 2,591,031 long tons and the quantity of iron ore exported from the United States in the same year amounted to 644,875 long tons.



DIAMOND PRODUCTION.
(in Pounds Sterling.)

THE NATIONAL BUREAU OF MINES.

The National Bureau of Mines for the United States was created by act of Congress approved May 16, and effective July 1, 1910. The chief purpose of the bureau is to carry on inquiries and investigations with the view of lessening loss of life and waste of resources in mining and metallurgical operations. It is to make investigations of the methods of mining, especially in relation to the safety of miners, the appliances best adapted to the prevention of mine accidents, the improvement of mining conditions, the treatment of ores and other mineral substances, as to the use of explosives and electricity in mining, and other inquiries and technologic investigations pertaining to mining, metallurgical and quarry industries. The act establishing the bureau provides that no officer or employee of the Bureau of Mines shall exercise any right or authority in connection with the inspection or supervision of mines and metallurgical plants in any state; under the Constitution such inspection and supervision is within the province of the State and is not germane to the duties of the Federal Government.

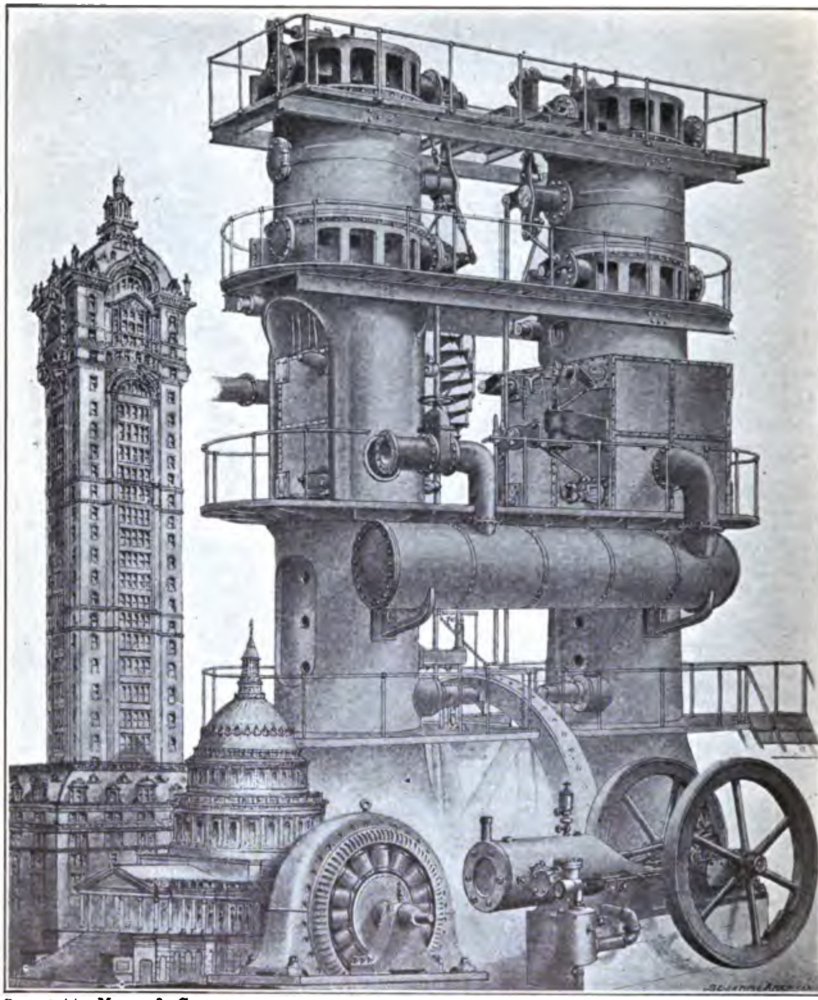
The scope of the fuel investigations of this bureau conforms to the provisions of the Act of Congress which provides for the analyzing and testing of coals, lignites, and other mineral fuel substances belonging to or for the use of the United States. Several lines of inquiry are embodied in this plan, which however, are too numerous to be mentioned here.

The act also transferred to the new Bureau of Mines the personnel and equipment of the technologic branch of the United States Geological Survey. This personnel and equipment were developed during the preceding five years in connection with the investigation of fuels and mine accidents, and the new bureau is to continue similar investigations.

Its chief Experimental Station is located at Pittsburgh, Pa. where the work in the laboratories is supplemented by experiments conducted in a small coal mine under the conditions of actual mining. At this station it also is conducting a number of investigations in connection with the use of explosives and electricity, and other mining problems.

As a means of carrying on an educational campaign in behalf of mine rescue and first aid to the injured work, the Bureau of Mines has purchased and equipped with rescue apparatus, first aid and fire fighting devices, seven cars of standard Pullman size, each completely fitted with modern appliances. These cars, one stationed in each of the important coal fields or coal mining regions of the country, will visit all the important groups of coal mines where demonstrations and illustrations of this work will be given.

The law establishing the Bureau of Mines became effective on July 1, 1910. On September 1st, Dr. J. A. Holmes, formerly Chief of the Technologic Branch of the Geological Survey, was appointed Director of the new Bureau.



GRAPHIC REPRESENTATION OF THE ENORMOUS ENERGY EXPENDED IN MANUFACTURES IN THE UNITED STATES.

The total steam power employed in manufactures in the United States in 1905 was 10,664,560. A single steam engine of this power would measure 400 feet by 255 feet on the base, and would extend 735 feet into the air, or 123 feet above the Singer building. To develop the total electric horse-power of 1,133,208 would call for a generator with a 134-foot base, and 126 feet high. The total of 298,514 gas engine power would require an engine 350 feet long by 80 feet high. Now the Woolworth Building could be substituted for the Singer Building.

CHAPTER IV.

MANUFACTURES.

MANUFACTURES: A SUMMARY OF THE PRINCIPAL ESTABLISHMENTS IN THE UNITED STATES AND NON-CONTIGUOUS TERRITORY, 1909.

	NUMBER OR AMOUNT.				
	Total.	Continental United States.	Alaska.	Hawaii.	Porto Rico.
Number of establishments	270,062	268,491	152	500	939
Persons engaged in manufactures	7,707,751	7,678,578	3,479	7,572	18,122
Proprietors and firm members	275,952	273,265	135	1,074	1,478
Salaried employees	792,168	790,267	245	594	1,062
Wage earners (average number)	6,639,931	6,615,046	3,099	5,904	15,582
Primary horsepower	18,760,686	18,680,776	3,975	41,930	34,005
Capital	$18,490,749,000	$18,428,270,000	$13,060,000	$23,875,000	$25,544,000
Expenses	18,525,426,000	18,453,080,000	9,454,000	31,753,000	31,139,000
Services	4,375,634,000	4,365,613,000	2,328,000	2,795,000	4,898,000
Salaries	940,900,000	938,575,000	380,000	686,000	1,259,000
Wages	3,434,734,000	3,427,038,000	1,948,000	2,109,000	3,639,000
Materials	12,194,019,000	12,141,791,000	5,120,000	25,629,000	21,479,000
Miscellaneous	1,955,773,000	1,945,676,000	2,006,000	3,329,000	4,762,000
Value of products	20,767,546,000	20,672,052,000	11,340,000	47,404,000	36,750,000
Value added by manufacture (value of products less cost of materials)	8,573,527,000	8,530,261,000	6,220,000	21,775,000	15,271,000

A SUMMARY OF THE PRINCIPAL ESTABLISHMENTS OF THE UNITED STATES FOR SPECIFIED YEARS: 1909, 1904, 1889; AND THE PER CENT. OF INCREASE.

	NUMBER OR AMOUNT.			PER CENT OF INCREASE.	
	1909	1904	1899	1904-1909	1899-1904
Number of establishments	268,491	216,180	207,514	24.2	4.2
Persons engaged in manufactures	7,678,578	6,213,612		23.6	
Proprietors and firm members	273,265	225,673		21.1	
Salaried employees	790,267	519,556	364,120	52.1	42.7
Wage earners (average number)	6,615,046	5,468,383	4,712,763	21.0	16.0
Primary horsepower	18,680,776	13,487,707	10,097,893	38.5	33.6
Capital	$18,428,270,000	$12,675,581,000	$8,975,256,000	45.4	41.2
Expenses	18,453,080,000	13,138,260,000	9,870,425,000	40.5	33.1
Services	4,365,613,000	3,184,884,000	2,389,132,000	37.1	33.3
Salaries	938,575,000	574,439,000	380,771,000	63.4	50.9
Wages	3,427,038,000	2,610,445,000	2,008,361,000	31.3	30.0
Materials	12,141,791,000	8,500,208,000	6,575,851,000	42.8	29.3
Miscellaneous	1,945,676,000	1,453,168,000	905,442,000	33.9	60.5
Value of products	20,672,052,000	14,793,903,000	11,406,927,000	39.7	29.7
Value added by manufacture (value of products less cost of materials)	8,530,261,000	6,293,695,000	4,831,076,000	35.5	30.3

CONDITIONS OF MANUFACTURES IN THE UNITED STATES AT EACH CENSUS: 1849–1909 (CONTINENTAL UNITED STATES ONLY.)

	Number of establishments.	Capital.	Wage earners (average number)	Wages.	Cost of materials.	Value of products.	Value added by manufacture.
Factories and hand and neighborhood industries:							
1849 (census of 1850)	123,025	$533,245,000	957,059	$236,755,000	$555,124,000	$1,019,107,000	$463,983,000
1859 (census of 1860)	140,433	1,009,856,000	1,311,246	378,879,000	1,031,605,000	1,885,862,000	854,257,000
Per cent of increase, 1849 to 1859	14.1	89.4	37.0	60.0	85.8	85.0	84.1
1869 (census of 1870) (gold value)	252,148	1,694,567,000	2,053,996	620,467,000	1,990,742,000	3,385,860,000	1,395,118,000
Per cent of increase, 1859 to 1869	79.6	67.8	56.6	63.8	93.0	79.5	63.3
1879 (census of 1880)	253,852	2,790,273,000	2,732,595	947,954,000	3,396,824,000	5,369,579,000	1,972,755,000
Per cent of increase, 1869 to 1879	0.7	64.7	33.0	52.8	90.6	74.5	41.4
1889 (census of 1890)	355,405	6,525,051,000	4,251,535	1,891,210,000	5,162,014,000	9,372,379,000	4,210,365,000
Per cent of increase, 1879 to 1889	40.0	133.8	55.6	99.5	52.0	74.5	113.4
1899 (census of 1900)	512,191	9,813,834,000	5,306,143	2,320,938,000	7,343,628,000	13,000,149,000	5,656,521,000
Per cent of increase, 1889 to 1899	44.1	50.4	24.8	22.7	42.3	38.7	34.3
Factories, excluding hand and neighborhood industries:							
1899 (census of 1900)	207,514	8,975,256,000	4,712,763	2,008,361,000	6,575,851,000	11,406,927,000	4,831,076,000
1904 (census of 1905)	216,180	12,675,581,000	5,468,383	2,610,445,000	8,500,208,000	14,793,903,000	6,293,695,000
Per cent of increase, 1899 to 1904	4.2	41.2	16.0	30.0	29.3	29.7	30.3
1909 (census of 1910)	268,491	18,428,270,000	6,615,046	3,427,038,000	12,141,791,000	20,672,052,000	8,530,261,000
Per cent of increase, 1904 to 1909	24.2	45.4	21.0	31.3	42.8	39.7	35.5
Per cent of increase, 1899 to 1909	29.4	105.3	40.4	70.6	84.6	81.2	76.6

VARIATION OF WAGE EARNERS EMPLOYED BY MONTHS.

Among the principal industries of the United States several show a great variation in the number of wage earners employed at various times of the year. The brick and tile industries employ an average of 76,528 wage earners during the year, the maximum number, 104,930, being employed in July, and the minimum number, 38,312, in January; the canning and preserving industries employ an average of 59,968 men, 154,800 being the maximum number in September, and 19,998 the minimum in January; the fertilizers employ an average of 18,310 men, the maximum number, 29,310, being reached in March, and the minimum number, 14,264, in July; oil, cottonseed, and cake industries employ an average of 17,071 men, the maximum number, 29,334 being reached in November, and the minimum, 5,174, in July; in the ice manufactories the average number of men employed was 16,114, the maximum number, 22,872, being reached in July, and the minimum, 9,847, in January; the artificial stone industries employed an average of 9,957 men, the maximum number, 12,884, being reached in August, and the minimum number, 4,856, in January; the straw and hats industries employed an average of 8,814 men, the maximum number of men employed being reached in March, when they employed 11,488 men, and the minimum number, 4,700, in July; in the sugar beet industries the average number of men employed was 7,209, the maximum number of employees, 16,807, being reached in November, and the minimum number, 2,206, in February; in the sugar and molasses industries the average number of employees was 4,127, the maximum number, 15,761, being reached in November, and the minimum, 559, in February; the vinegar and cider industries employed an average of 1,542 men, the maximum number, 3,464, being reached in October, and the minimum number, 886, being reached in March.

LEADING MANUFACTURING INDUSTRIES IN THE UNITED STATES 1909.

INDUSTRY.	Number of establishments.	WAGE EARNERS.			VALUE OF PRODUCTS.		
		Average number.	Rank.	Per cent distribution.	Amount (expressed in thousands).	Rank.	Per cent distribution.
All industries	**268,491**	**6,615,046**	....	**100.0**	**$20,672,052**	....	**100.0**
Slaughtering and meat packing	1,641	89,728	16	1.4	1,370,568	1	6.6
Foundry and machine-shop products	13,253	531,011	2	8.0	1,228,475	2	5.9
Lumber and timber products	40,671	695,019	1	10.5	1,156,129	3	5.6
Iron and steel, steel works and rolling mills	446	240,076	6	3.6	985,723	4	4.8
Flour-mill and gristmill products	11,691	39,453	30	0.6	883,584	5	4.3
Printing and publishing	31,445	258,434	5	3.9	737,876	6	3.6
Cotton goods, including cotton small wares	1,324	378,880	3	5.7	628,392	7	3.0
Clothing, men's, including shirts	6,354	239,696	7	3.6	568,077	8	2.7
Boots and shoes, including cut stock and findings	1,918	198,297	8	3.0	512,798	9	2.5
Woolen, worsted, and felt goods, and wool hats	985	168,722	9	2.6	435,979	10	2.1
Tobacco manufactures	15,822	166,810	10	2.5	416,695	11	2.0
Cars and general shop construction and repairs by steam-railroad companies	1,145	282,174	4	4.3	405,601	12	2.0
Bread and other bakery products	23,926	100,216	14	1.5	396,865	13	1.9
Iron and steel, blast furnaces	208	38,429	31	0.6	391,429	14	1.9
Clothing, women's	4,558	153,743	11	2.3	384,752	15	1.9
Smelting and refining, copper	38	15,628	38	0.2	378,806	16	1.8
Liquors, malt	1,414	54,579	25	0.8	374,730	17	1.8
Leather, tanned, curried, and finished	919	62,202	23	0.9	327,874	18	1.6
Sugar and molasses, not including beet sugar	233	13,526	41	0.2	279,249	19	1.4
Butter, cheese, and condensed milk	8,479	18,431	36	0.3	274,558	20	1.3
Paper and wood pulp	777	75,978	17	1.2	267,657	21	1.3
Automobiles, including bodies and parts	743	75,721	19	1.1	249,202	22	1.2
Furniture and refrigerators	3,155	128,452	13	1.9	239,887	23	1.2
Petroleum, refining	147	13,929	40	0.2	236,998	24	1.1
Electrical machinery, apparatus, and supplies	1,009	87,256	18	1.3	221,309	25	1.1
Liquors, distilled	613	6,430	43	0.1	204,699	26	1.0
Hosiery and knit goods	1,374	129,275	12	2.0	200,144	27	1.0
Copper, tin, and sheet-iron products	4,228	73,615	20	1.1	199,824	28	1.0
Silk and silk goods, including throwsters	852	99,037	15	1.5	196,912	29	1.0
Smelting and refining, lead	28	7,424	42	0.1	167,406	30	0.8
Gas, illuminating and heating	1,296	37,215	32	0.6	166,814	31	0.8
Carriages and wagons and materials	5,492	69,928	21	1.1	159,893	32	0.8
Canning and preserving	3,767	59,968	24	0.9	157,101	33	0.8
Brass and bronze products	1,021	40,618	29	0.6	149,989	34	0.7
Oil, cottonseed, and cake	817	17,071	37	0.3	147,868	35	0.7
Agricultural implements	640	50,551	26	0.8	146,329	36	0.7
Patent medicines and compounds and druggists' preparations	3,642	22,895	35	0.3	141,942	37	0.7
Confectionery	1,944	44,638	27	0.7	134,796	38	0.7
Paint and varnish	791	14,240	39	0.2	124,889	39	0.6
Cars, steam-railroad, not including operations of railroad companies	110	43,086	28	0.7	123,730	40	0.6
Chemicals	349	23,714	34	0.4	117,689	41	0.6
Marble and stone work	4,964	65,603	22	1.0	113,093	42	0.5
Leather goods	2,375	34,907	33	0.5	104,719	43	0.5
All other industries	61,887	1,648,441	....	24.9	4,561,002	....	22.0

SUMMARY OF INDUSTRIES, BY STATES AND WAGE EARNERS: 1909.

STATE.	Population.	Number of establishments.	WAGE EARNERS.			VALUE OF PRODUCTS.		
			Average number.	Rank.	Per cent distribution.	Amount (expressed in thousands).	Rank.	Per cent distribution.
United States	**91,972,266**	**268,491**	**6,615,046**	....	**100.0**	**$20,672,052**	....	**100.0**
New York	9,113,614	44,935	1,003,981	1	15.2	3,369,490	1	16.3
Pennsylvania	7,665,111	27,563	877,543	2	13.3	2,626,742	2	12.7
Illinois	5,638,591	18,026	465,764	4	7.0	1,919,277	3	9.3
Massachusetts	3,366,416	11,684	584,559	3	8.8	1,490,529	4	7.2
Ohio	4,767,121	15,138	446,934	5	6.8	1,437,936	5	7.0
New Jersey	2,537,167	8,817	326,223	6	4.9	1,145,529	6	5.5
Michigan	2,810,173	9,159	231,499	7	3.5	685,109	7	3.3
Wisconsin	2,333,860	9,721	182,583	10	2.8	590,306	8	2.9
Indiana	2,700,876	7,969	186,984	9	2.8	579,075	9	2.8
Missouri	3,293,335	8,375	152,993	11	2.3	574,111	10	2.8
California	2,377,549	7,659	115,296	13	1.7	529,761	11	2.6
Connecticut	1,114,756	4,251	210,792	8	3.2	490,272	12	2.4
Minnesota	2,075,708	5,561	84,767	18	1.3	409,420	13	2.0
Kansas	1,690,949	3,435	44,215	33	0.7	325,104	14	1.6
Maryland	1,295,346	4,837	107,921	15	1.6	315,669	15	1.5
Rhode Island	542,610	1,951	113,538	14	1.7	280,344	16	1.4
Texas	3,896,542	4,588	70,230	25	1.1	272,896	17	1.3
Iowa	2,224,771	5,528	61,635	29	0.9	259,238	18	1.2
Louisiana	1,656,388	2,516	76,165	21	1.2	223,949	19	1.1
Kentucky	2,289,905	4,776	65,400	27	1.0	223,754	20	1.1
Washington	1,141,990	3,674	69,120	26	1.0	220,746	21	1.1
Virginia	2,061,612	5,685	105,676	16	1.6	219,794	22	1.1
North Carolina	2,206,287	4,931	121,473	12	1.8	216,656	23	1.0
Georgia	2,609,121	4,792	104,588	17	1.6	202,863	24	1.0
Nebraska	1,192,214	2,500	24,336	37	0.4	199,019	25	1.0
Tennessee	2,184,789	4,609	73,840	22	1.1	180,217	26	0.9
Maine	742,371	3,546	79,955	19	1.2	176,029	27	0.8
New Hampshire	430,572	1,961	78,658	20	1.2	164,581	28	0.8
West Virginia	1,221,119	2,586	63,893	28	1.0	161,950	29	0.8
Alabama	2,138,093	3,398	72,148	24	1.1	145,962	30	0.7
Colorado	799,024	2,034	28,067	36	0.4	130,044	31	0.6
South Carolina	1,515,400	1,854	73,046	23	1.1	113,236	32	0.5
Oregon	672,765	2,246	28,750	35	0.4	93,005	33	0.4
Mississippi	1,797,114	2,598	50,384	31	0.8	80,555	34	0.4
Arkansas	1,574,449	2,925	44,982	32	0.7	74,916	35	0.4
Montana	376,053	677	11,655	41	0.2	73,272	36	0.4
Florida	752,619	2,159	57,473	30	0.9	72,890	37	0.4
Vermont	355,956	1,958	33,788	34	0.5	68,310	38	0.3
Utah	373,351	749	11,785	40	0.2	61,989	39	0.3
Oklahoma	1,657,155	2,310	13,143	39	0.2	53,682	40	0.3
Delaware	202,322	726	21,238	38	0.3	52,840	41	0.3
Arizona	204,354	311	6,441	44	0.1	50,257	42	0.2
District of Columbia	331,069	518	7,707	43	0.1	25,289	43	0.1
Idaho	325,594	725	8,220	42	0.1	22,400	44	0.1
North Dakota	577,056	752	2,789	48	(¹)	19,138	45	0.1
South Dakota	583,888	1,020	3,602	46	0.1	17,870	46	0.1
Nevada	81,875	177	2,257	49	(¹)	11,887	47	0.1
New Mexico	327,301	313	4,143	45	0.1	7,898	48	(¹)
Wyoming	145,965	268	2,867	47	(¹)	6,249	49	(¹)

SUMMARY OF MANUFACTURES, BY PRINCIPAL CITIES BY RANK: 1909.

CITY.	Population.	Number of establishments.	WAGE EARNERS.		VALUE OF PRODUCTS.	
			Average number.	Rank.	Amount (expressed in thousands).	Rank.
New York, N. Y.	4,766,883	25,938	554,002	1	$2,029,693	1
Chicago, Ill.	2,185,283	9,656	293,977	2	1,281,171	2
Philadelphia, Pa.	1,549,008	8,379	251,884	3	746,076	3
St. Louis, Mo.	687,029	2,667	87,371	4	328,495	4
Cleveland, Ohio	560,663	2.148	84,728	5	271,961	5
Detroit, Mich.	465,766	2,036	81,011	6	252,992	6
Pittsburgh, Pa.	533,905	1,659	67,474	9	243,454	7
Boston, Mass.	670,585	3,155	69,637	8	237,457	8
Buffalo, N. Y.	423,715	1,753	51,412	13	218,804	9
Milwaukee, Wis.	373,857	1,764	59,502	12	208,324	10
Newark, N. J.	347,469	1,858	59,955	11	202,511	11
Cincinnati, Ohio	363,591	2,184	60,192	10	194,516	12
Baltimore, Md.	558,485	2,502	71,444	7	186,978	13
Minneapolis, Minn.	301,408	1,102	26,962	25	165,405	14
Kansas City, Kans.	82,331	165	12,294	42	164,081	15
San Francisco, Cal.	416,912	1,796	28,244	21	133,041	16
Jersey City, N. J.	267,779	745	25,454	28	128,775	17
Indianapolis, Ind.	233,650	855	31,815	19	126,522	18
Providence, R. I.	224,326	1,080	46,381	14	120,241	19
Rochester, N. Y.	218,149	1,203	39,108	15	112,676	20
Louisville, Ky.	223,928	903	27,023	24	101,284	21
South Omaha, Nebr.	26,259	71	6,306	48	92,436	22
Youngstown, Ohio	79,066	115	10,498	45	81,271	23
Lawrence, Mass.	85.892	162	30,542	20	79,993	24
New Orleans, La.	339,075	848	17,186	37	78,794	25
Worcester, Mass.	145,986	580	28,221	22	77,148	26
Bayonne, N. J.	55,545	97	7,519	47	73,641	27
Akron, Ohio	69,067	246	15,831	39	73,158	28
Perth Amboy, N. J.	32,121	80	5,866	50	73,093	29
Lynn, Mass.	89,336	431	27,368	23	71,503	30
Paterson, N. J.	125,600	702	32,004	18	69,584	31
Los Angeles, Cal.	319,198	1,325	17,327	36	68,586	32
Bridgeport, Conn.	102,054	367	25,775	27	65,609	33
Fall River, Mass.	119,295	288	37,139	16	64,146	34
Peoria, Ill.	66,950	283	5,981	49	63,061	35
Toledo, Ohio	168,497	760	18,878	34	61,230	36
Omaha, Nebr.	124,096	432	8,023	46	60,854	37
Dayton, Ohio	116.577	513	21,549	31	60,378	38
Lowell, Mass.	106,294	320	32,575	17	60,271	39
Yonkers, N. Y.	79,803	158	12,711	41	59,334	40
St. Paul, Minn.	214,744	719	19,339	33	58,990	41
Kansas City, Mo.	248,381	902	14,643	40	54,704	42
New Bedford, Mass.	96,652	207	26,566	26	53,238	43
Denver, Colo.	213,381	766	12,058	43	51,538	44
Reading, Pa.	96,071	482	24,145	29	51,135	45
New Haven, Conn.	133,605	590	23.547	30	51,071	46
Seattle, Wash.	237,194	751	11,331	44	50,569	47
Waterbury, Conn.	73,141	169	20,170	32	50,350	48
Syracuse, N. Y.	137,249	738	18,148	35	49,435	49
Camden, N. J.	94,538	365	16,527	38	49,138	50

OCCUPATIONS—STATUS BY LEADING INDUSTRIES, 1909.

INDUSTRY.	PERSONS ENGAGED IN MANUFACTURES.									
	Total number.	Proprietors and officials.				Clerks.	Wage earners (average number).	Per cent of total.		
		Total.	Proprietors and firm members.	Salaried officials of corporations.	Superintendents and managers.			Proprietors and officials.	Clerks.	Wage earners (average number).
All industries	**7,678,578**	**487,173**	**273,265**	**80,735**	**133,173**	**576,359**	**6,615,046**	**6.3**	**7.5**	**86.1**
Agricultural implements	60,229	2,489	465	569	1,455	7,189	50,551	4.1	11.9	83.9
Automobiles, including bodies and parts	85,359	2,564	405	758	1,401	7,074	75,721	3.0	8.3	88.7
Boots and shoes, including cut stock and findings	215,923	5,752	1,838	1,027	2,887	11,874	198,297	2.7	5.5	91.8
Brass and bronze products	45,441	2,160	828	584	748	2,663	40,618	4.8	5.9	89.4
Bread and other bakery products	144,322	29,136	26,982	801	1,353	14,970	100,216	20.2	10.4	69.4
Butter, cheese, and condensed milk	31,506	10,480	8,019	1,032	1,429	2,595	18,431	33.3	8.2	58.5
Canning and preserving	71,972	6,920	4,244	968	1,708	5,084	59,968	9.6	7.1	83.3
Carriages and wagons and materials	82,944	8,844	6,213	1,166	1,465	4,172	69,928	10.7	5.0	84.3
Cars and general shop construction and repairs by steam-railroad companies	301,273	6,974	2	1,877	5,095	12,125	282,174	2.3	4.0	93.7
Cars, steam-railroad, not including operations of railroad companies	47,094	1,041	7	241	793	2,967	43,086	2.2	6.3	91.5
Chemicals	27,791	1,086	154	367	565	2,991	23,714	3.9	10.8	85.3
Clothing, men's, including shirts	271,437	12,041	8,502	1,089	2,450	19,700	239,696	4.4	7.3	88.3
Clothing, women's	179,021	9,281	6,482	842	1,957	15,997	153,743	5.2	8.9	85.9
Confectionery	54,854	3,362	1,832	766	764	6,854	44,638	6.1	12.5	81.4
Copper, tin, and sheet-iron products	86,934	7,269	4,423	1,288	1,558	6,050	73,615	8.4	7.0	84.7
Cotton goods, including cotton small wares	387,771	4,461	377	1,726	2,358	4,430	378,880	1.2	1.1	97.7
Electrical machinery, apparatus, and supplies	105,600	4,121	439	997	2,685	14,223	87,256	3.9	13.5	82.6
Flour-mill and gristmill products	66,054	18,763	14,570	1,486	2,707	7,838	39,453	28.4	11.9	59.7
Foundry and machine-shop products	615,485	31,605	9,851	9,348	12,406	52,869	531,011	5.1	8.6	86.3
Furniture and refrigerators	144,140	7,281	2,657	2,170	2,454	8,407	128,452	5.1	5.8	89.1

THE DARWINIAN THEORY.

In 1859, Charles Darwin published a work entitled "Origin of Species," to prove that the numerous species now existing on the earth sprang originally from one or at most a few primal forms; and that the present diversity is due to special development and natural selection. Those plants and creatures which are best suited to the conditions of their existence survive and become fruitful; certain organs called into play by peculiar conditions of life grow with their growth and strengthen with their strength till they become so much a part and parcel of their frames as to be transmitted to their offspring. The conditions of life being very diverse, cause a great diversity of organic development, and, of course, every such diversity which has become radical is the parent of a new species.

OCCUPATIONS—STATUS BY LEADING INDUSTRIES—*Continued.*

INDUSTRY.	PERSONS ENGAGED IN MANUFACTURES.									
	Total number.	Proprietors and officials.				Clerks.	Wage earners (average number).	Per cent of total.		
		Total.	Proprietors and firm members.	Salaried officials of corporations.	Superintendents and managers.			Proprietors and officials.	Clerks.	Wage earners (average number).
Gas, illuminating and heating	51,007	2,986	277	990	1,719	10,806	37,215	5.9	21.2	73.0
Hosiery and knit goods	136,130	3,308	1,134	799	1,375	3,547	129,275	2.4	2.6	94.9
Iron and steel, blast furnaces	43,061	1,119	48	262	809	3,513	38,429	2.6	8.2	89.2
Iron and steel, steel works and rolling mills	260,762	4,286	47	779	3,460	16,400	240,076	1.6	6.3	92.1
Leather goods	43,525	4,209	2,552	760	897	4,409	34,907	9.7	10.1	80.2
Leather, tanned, curried, and finished	67,100	2,331	784	629	918	2,567	62,202	3.5	3.8	92.7
Liquors, distilled	8,328	1,111	563	217	331	787	6,430	13.3	9.4	77.2
Liquors, malt	66,725	4,362	639	1,819	1,904	7,784	54,579	6.5	11.7	81.8
Lumber and timber products	784,989	68,165	48,825	6,616	12,724	21,805	695,019	8.7	2.8	88.5
Marble and stone work	77,275	8,453	6,026	867	1,560	3,219	65,603	10.9	4.2	84.9
Oil, cottonseed, and cake	21,273	2,167	110	576	1,481	2,035	17,071	10.2	9.6	80.2
Paint and varnish	21,896	2,016	456	793	767	5,640	14,240	9.2	25.8	65.0
Paper and wood pulp	81,473	2,298	250	773	1,275	3,197	75,978	2.8	3.9	93.3
Patent medicines and compounds and druggists' preparations	41,101	5,647	2,802	1,427	1,418	12,559	22,895	13.7	30.6	55.7
Petroleum, refining	16,640	671	42	211	418	2,040	13,929	4.0	12.3	83.7
Printing and publishing	388,466	49,332	30,424	7,265	11,643	80,700	258,434	12.7	20.8	66.5
Silk and silk goods, including throwsters	105,238	2,236	664	480	1,092	3,965	99,037	2.1	3.8	94.1
Slaughtering and meat packing	108,716	3,514	1,659	731	1,124	15,474	89,728	3.2	14.2	82.5
Smelting and refining, copper	16,832	275	7	53	215	929	15,628	1.6	5.5	92.8
Smelting and refining, lead	8,059	132	....	44	88	503	7,424	1.6	6.2	92.1
Sugar and molasses, not including beet sugar	15,658	789	204	140	445	1,343	13,526	5.0	8.6	86.4
Tobacco manufactures	197,637	21,012	17,634	809	2,569	9,815	166,810	10.6	5.0	84.4
Woolen, worsted, and felt goods, and wool hats	175,176	3,192	732	782	1,678	3,262	168,722	1.8	1.9	96.3
All other industries	1,916,361	117,932	59,096	23,811	35,025	149,988	1,648,441	6.2	7.8	86.0

THE BULK AND WEIGHT OF OUR RAINFALL.

To anyone who is familiar only with the customary method of stating rainfall, it is somewhat startling to learn, for instance that 43.9 cubic miles of rain fell in Missouri during the year 1896. This is decidedly more impressive than the statement that the rainfall was about 41 inches. In the same year 1296.4 cubic miles of water is computed to have fallen over the whole of the United States, and the average annual rainfall is somewhat greater than this: viz., 1,308 cubic miles, weighing 6,000,000,000,000 tons. As an illustration of the fact that most of the water that falls as rain never reaches the sea through the medium of drainage, but is evaporated from the land, it has been shown that the discharge of the Mississippi River at St. Louis is but little greater than the volume of rainfall over the State of Missouri alone, despite the enormous area drained by the river above that point.

DISTRIBUTION OF EXPENSES IN PERCENTAGES FOR THE LEADING INDUSTRIES 1909.

INDUSTRY.	PER CENT OF TOTAL EXPENSES REPORTED.			
	Salaries.	Wages.	Materials.	Miscellaneous expenses.
All industries	**5.1**	**18.6**	**65.8**	**10.5**
Agricultural implements	8.6	24.3	51.1	16.0
Automobiles, including bodies and parts	4.5	23.1	62.5	9.9
Boots and shoes, including cut stock and findings	3.9	20.6	69.6	5.9
Brass and bronze products	4.1	17.3	72.6	6.0
Bread and other bakery products	4.0	17.4	69.9	8.6
Butter, cheese, and condensed milk	1.4	4.3	91.0	3.3
Canning and preserving	5.6	13.5	72.0	9.0
Carriages and wagons and materials	5.7	27.0	58.9	8.4
Cars and general shop construction and repairs by steam-railroad companies	4.3	44.7	49.2	1.8
Cars, steam-railroad, not including operations of railroad companies	4.3	23.0	66.7	6.0
Chemicals	6.5	15.0	68.2	10.3
Clothing, men's, including shirts	5.2	20.7	57.9	16.2
Clothing, women's	6.0	23.0	61.1	9.9
Confectionery	7.6	13.1	67.9	11.4
Copper, tin, and sheet-iron products	5.8	22.4	63.7	8.1
Cotton goods, including cotton small wares	2.6	24.0	66.9	6.5
Electrical machinery, apparatus, and supplies	10.0	24.5	53.8	11.7
Flour-mill and gristmill products	1.5	2.6	92.8	3.1
Foundry and machine-shop products	8.7	29.8	50.1	11.4
Furniture and refrigerators	7.3	30.8	51.0	10.9
Gas, illuminating and heating	10.9	18.4	46.2	24.5
Hosiery and knit goods	4.4	25.5	62.7	7.4
Iron and steel, blast furnaces	1.8	6.8	88.4	3.0
Iron and steel, steel works and rolling mills	2.9	18.3	73.9	4.8
Leather goods	7.2	19.3	64.6	8.9
Leather, tanned, curried, and finished	2.2	10.5	81.2	6.1
Liquors, distilled	1.0	1.6	18.4	79.0
Liquors, malt	7.6	13.7	32.2	46.5
Lumber and timber products	4.8	32.0	51.0	12.2
Marble and stone work	6.7	44.8	39.4	9.1
Oil, cottonseed, and cake	3.1	4.3	87.7	4.9
Paint and varnish	9.3	7.4	71.1	12.2
Paper and wood pulp	4.0	17.2	69.7	9.1
Patent medicines and compounds and druggists' preparations	14.9	8.7	44.1	32.4
Petroleum, refining	1.8	4.4	89.6	4.2
Printing and publishing	16.7	26.6	32.6	24.1
Silk and silk goods, including throwsters	4.2	21.8	60.8	13.2
Slaughtering and meat packing	1.5	3.9	91.3	3.3
Smelting and refining, copper	0.7	3.8	94.4	1.1
Smelting and refining, lead	0.9	3.4	94.8	0.9
Sugar and molasses, not including beet sugar	0.9	2.8	92.6	3.7
Tobacco manufactures	4.6	19.0	48.4	28.0
Woolen, worsted, and felt goods, and wool hats	2.6	18.7	72.9	5.8
All other industries	6.4	21.1	62.1	10.5

I. ENGINES AND POWER.

In 1909 408,472 engines or motors, having a total horse-power of 18,675,376, used primary power in the United States. Of this number 209,163 were owned and 199,309 were rented. The owned engines or motors were divided according to power, as follows: Steam, 153,525 with total horse-power of 14,199,339, gas, 34,356, total horse-power 751,186, water wheels, 20,079, total horse-power 1,807,439, water motors, 1,203, total horse-power 15,449; all other owned engines or motors having a horse-power of 29,293. The rented engines were divided as follows: Electric, 199,309, total horse-power 1,749,031; all other rented engines or motors having a total horse-power of 123,639. At the end of the year 1909 there were 388,854 electric motors in the United States, having a total horse-power of 4,817,140. Of these 189,545, having a horse-power of 3,068,109, were run by current generated by establishment; and 199,309, having a total horse-power of 1,749,031, were run by rented power. Our comparison would be even more spectacular if figures for the year 1912 could be obtained.

II. MANUFACTURED FOOD PRODUCTS.

Slaughtering and Meat Packing.

The total cost of all the material used in the slaughtering and meat-packing business during the year 1909, amounted to $1,202,827,784. The cost of all the animals slaughtered was $960,725,581. The total number of beeves killed was 8,114,860 and they were valued at $392,127,010; the total number of calves slaughtered was 2,504,728 and they were valued at $25,030,014; the number of sheep slaughtered was 12,255,501, and their value was $59,924,931; the number of hogs slaughtered amounted to 33,870,616 and their value was $483,383,848; the goats slaughtered numbered 33,224 and were valued at $121,230; and the cost of all other animals slaughtered was $138,548. The dressed meat purchased during the year 1909 was valued at $93,409,286, and all the other materials purchased at $147,692,917. The products of the slaughtering and meat packing business for the year were valued at $1,370,568,101 and were divided as follows: Beef, 4,335,674,330 pounds, value, $339,742,608; of which 4,209,196,668 pounds, valued at $327,583,456, were fresh, and 126,477,662 pounds, valued at $12,159,152, were salted or cured; veal, 252,997,078 pounds, value, $25,058,886; fresh mutton, 495,457,894, value, $50,735,116; pork, 4,377,127,187, value, $486,845,161, of which 1,547,494,184 pounds, valued at $158,714,862, were fresh; 952,130,557 pounds, valued at $95,959,048, were salted; 739,861,744 pounds, valued at $101,089,390, were hams; 346,294,769 pounds, valued at $33,225,458, were shoulders; and 741,345,933 pounds, valued at $97,856,403, were bacons and sides; sausage, fresh or cured, value, $59,564,582; all other fresh meat, 257,809,083 pounds, value, $16,392,768; canned goods, 121,376,837 pounds, value, $15,345,543; lard, 1,243,567,604 pounds, value, $134,396,587; tallow or oleo stock, 202,844,139 pounds, value, $13,499,659; oleo oil, 19,692,172 gallons, value, $16,475,726; other oils, 11,343,186 gallons, value, $6,350,745; oleomargarine, 42,912,466 pounds, value, $5,963,981; stearin, 54,957,997 pounds, value, $6,871,935; glue and gelatine, 27,936,035 pounds, value, $1,944,338; fertilizers and fertilizer materials, 362,136 tons, value, $8,726,818; hides, 9,560,138, value, $68,401,515; sheep pelts, 11,691,308, value, $11,404,556; goat and kid skins, 33,359, value, $20,679; wool, 21,858,926 pounds, value, $8,327,095; amount received for custom or contract work, $1,329,739; and all other products, value, $93,170,064.

Canning and Preserving.

At the end of the year 1909 there were 3,767 canning and preserving establishments in the United States, having a total capital of $119,207,000. The total cost of all materials used in the establishments was $101,823,000; the amount spent in these factories for wages was $19,082,000; the amount spent for salaries $7,864,000; and the miscellaneous expenses were $12,718,000. The total value of the products was $157,101,000, and the value added by manufacture (products less cost of materials) was $55,278,000. The total number of salaried officials and clerks employed in the establishments numbered 7,760; and the average number of wage earners employed during the year was 59,968. The primary horse-power of the establishments was 81,179.

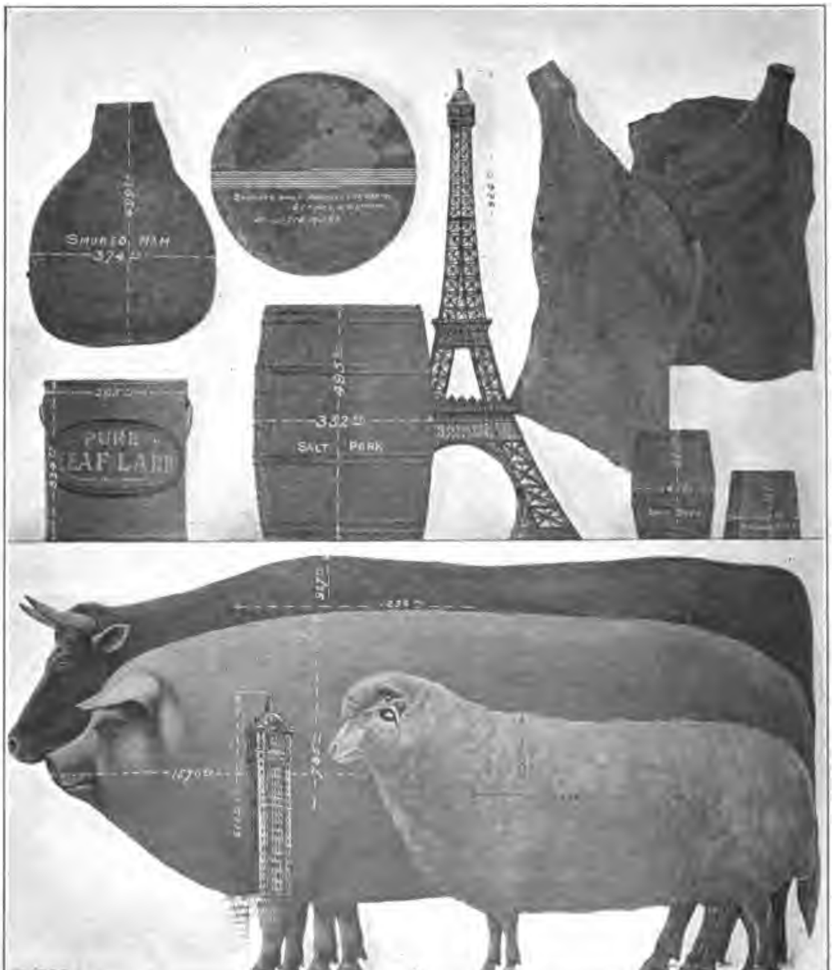
There were 32,752,469 cases of vegetables, having a value of $51,568,914, canned during the year. The total value of the tomatoes canned during the year was $18,747,941; the value of the corn, $10,332,136; of peas, $10,247,363; of beans, $6,013,098; of asparagus, $1,975,775. There were 5,501,404 cases of fruits canned during the year 1909, and their total value was $12,938,474. The total value of the peaches canned during the year was $3,753,698; of the apples, $1,898,720; of the apricots, $1,825,311; of the pears, $1,833,214; of the berries, $1,754,927; of the cherries, $1,019,013. During the same year there were 400,328,767 pounds of fruits, with a total value of $19,840,395 dried in the United States. Of this total $4,837,933 represented the value of the raisins dried; $5,130,412 that of the prunes; $3,098,095 that of the apples; $2,423,083 that of the peaches; $2,277,177 that of the apricots.

During the year 1909 there were 235,418,713 pounds of fish and oysters, with a value of $17,573,311, canned in the United States. There were 99,831,528 pounds of salmon, with a value of $8,723,565, canned during the year; 90,694,284 pounds of sardines, with a value of $4,931,831; 28,192,392 pounds of oysters, with a value of $2,443,101. There were 39,814,989 pounds of fish, having a value of $2,900,417, smoked during the year 1909; and 128,539,299 pounds of fish, having a value of $7,174,561.

salted during the year. 49,494,338 pounds of cod, with a value of $3,077,612, were salted during this period; and 9,045,469 pounds of mackerel, with a value of $740,513.

Rice, Cleaning and Polishing.

In 1909 there were 974,747,475 pounds of rice treated, 970,873,740 of which were domestic and 3,873,735 of which were of foreign growth. The total value of the products derived therefrom amounted to $22,371,457. There were 626,089,489 pounds of rice, valued at $20,685,982, produced in the United States, 477,589,004 of which, valued at $17,398,736, were whole and 148,500,485 pounds of which, valued at $3,287,246, were broken. There was 29,821,813 pounds of polish, valued at $362,052, produced from rice during the year; 91,208,529 pounds of bran, valued at $736,215; $166,147 worth of hulls and waste; and $421,061 worth of all other rice products.



THE MEATS WE EAT.

FLOUR AND GRIST MILL PRODUCTS.

	1909	1904	1899
MATERIALS.			
Total cost	$767,576,479	$619,971,161	$428,116,757
Grain ground or milled, bushels	806,247,961	754,945,729	729,061,820
Wheat	496,480,314	494,095,083	471,306,986
Corn	209,281,237	178,217,321	180,573,076
Rye	11,503,969	11,480,370	10,088,381
Buckwheat	7,156,062	6,531,305	5,490,156
Barley	24,509,770	18,628,552	10,067,348
Oats	50,241,598	45,381,009	47,175,766
Other	7,075,011	612,089	4,360,107
PRODUCTS.			
Total value	[1] $883,584,405	[2] $713,033,395	$501,396,304
Wheat flour:			
Barrels	105,756,645	104,013,278	99,763,777
Value	$550,116,254	$480,258,514	$333,997,686
White—			
Barrels	105,321,969	103,608,350	(3)
Value	$548,017,654	$478,484,601	(3)
Graham—			
Barrels	434,676	404,928	(3)
Value	$2,098,600	$1,773,913	(3)
Rye flour:			
Barrels	1,532,139	1,503,100	1,443,339
Value	$6,383,538	$5,892,108	$4,145,565
Buckwheat flour:			
Pounds	176,081,891	175,354,062	143,190,724
Value	$4,663,561	$4,379,359	$3,190,152
Barley meal:			
Pounds	28,550,952	68,508,655	91,275,646
Value	$486,000	$922,884	$963,710
Corn meal and corn flour:			
Barrels	21,552,737	23,624,693	27,838,811
Value	$66,941,095	$56,368,556	$52,167,739
Hominy and grits:			
Pounds	827,987,702	756,861,398	291,726,145
Value	$12,509,493	$8,455,420	$2,567,084
Feed:			
Tons (2,000 pounds)	5,132,369	3,456,786	3,993,080
Value	$140,541,915	$76,096,127	$63,011,421
Offal:			
Tons (2,000 pounds)	4,104,042	4,468,626	3,164,408
Value	$89,814,427	$76,105,532	$36,679,196
All other cereal products—"breakfast foods," oatmeal, rolled oats, etc., value	$4,720,106	(3)	(3)
All other products, value	$7,408,016	$4,554,895	$4,673,751
EQUIPMENT.			
Pairs of rolls	76,866	80,822	67,141
Runs of stone	11,185	10,609	10,939
Attrition mills	981	(4)	(4)

[1] In addition, merchant-ground products, valued at $1,637,228, were made by establishments engaged primarily in the manufacture of products other than those covered by the industry designation. The items covered by this amount were wheat flour, 105,477 barrels, valued at $614,952; corn meal, 32,804 barrels, valued at $87,507; rye flour, 2,620 barrels, valued at $12,330; feed, 33,765 tons, valued at $907,165; and offal, 627 tons, valued at $15,274; and in addition, "breakfast foods," to the value of $36,978,613, were made by establishments engaged primarily in the manufacture of food preparations. See note to table on page 73, for custom ground by-products.

[2] In addition, "breakfast foods," to the value of $23,904,952, were made by establishments engaged primarily in the manufacture of food preparations.

[3] Not reported separately.

[4] Not reported.

SUGAR.

The total acreage of sugar beets planted in the United States amounted to 415,964. Of these 29,459 were planted directly by the factory; 18,166 by tenants of the factory; 368,339 on contract by others than tenants of the factory. There were 3,965,356 tons of beets used in the industry. Of these 266,768 were grown directly by the factory; 163,843 tons by tenants of the factory; and 3,534,745 tons on contract by others than the tenants of the factory. The total value of the products derived from the beets was $48,122,383. Of this 496,807 tons of granulated sugar were valued at $45,645,810; 4,875 tons of raw sugar were valued at $291,819; 20,812,747 gallons of molasses or syrup were valued at $1,129,905; beet pulp was valued at $795,900; and all other products were valued at $258,949.

The total value of all the sugar produced in the United States during the year 1909 was $77,991,683, and of this $48,122,383 was derived from the sugar-beet industry, and $29,869,300 from the cane-sugar industry. There were 828,540 tons of sugar produced, the total value of which was $72,033,302, of which amount 501,862 pounds, valued at $45,937,629, were beet sugar, and 326,858 pounds, valued at $26,095,673, were cane sugar. The total value of molasses, syrup, and all other products produced of either cane or beet was $5,958,381.

III. TEXTILES.

Rugs and Carpets.

During the year 1909 there were 57,176,729 square yards of carpets, with a value of $48,475,889, manufactured in the United States. During the same period there were 24,042,152 square yards of rugs, valued at $18,490,449, woven in the United States.

Cordage and Twine and Jute and Linen Goods.

The total value of the cordage and twine and jute and linen goods produced in the United States during the year 1909 was $61,019,986. The total value of the rope and binder twine for the same year was $33,930,306; of the twine not including binder, $8,934,352; of the yarns for sale, $5,434,037; of the 6,530,503 pounds of linen thread used, $3,407,008; of the 69,311,288 square yards of gunny-bagging, $3,507,482; and of the 2,206,114 square yards of jute carpets and rugs, $549,221.

Felt Goods.

The aggregate cost of the material required in the production of the felt goods of the United States during the year 1909 was $6,967,206, and the total value of these products for the same period was $11,852,626. There were 3,764,468 square yards of felt cloths, valued at $1,381,854, produced in that year.

Hats, Fur-Felt and Wool-Felt.

The value of the 2,989,252 dozens of fur-felt hats produced during the year 1909 was $43,442,466, and the value of the 366,370 dozen of fur-felt hat bodies and hats in the rough for the same period was $2,703,738.

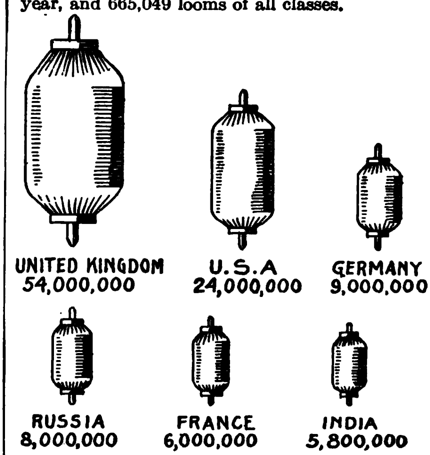
The total value of the 590,957 dozen wool-felt hats produced in the United States during the year 1909 was $3,646,787.

Hosiery and Knit Goods.

There were, during the year 1909, 62,825,069 dozen pair of hosiery produced in the United States and they were valued at $68,721,825. During the same period there were 25,337,779 dozen shirts and drawers produced, with a total value of $69,592,817; 2,473,103 dozen combinations, with a value of $14,853,536; sweaters, cardigan jackets, etc., to the value of $22,430,817; and gloves and mittens to the value of $7,296,887. In the production of the hosiery and knit goods of the United States there were 2,681 sets of cards used; 736,774 spindles; 112,206 knitting machines of all classes, and 43,885 sewing machines of all classes.

Cotton Goods.

The total cost of the 2,335,344,906 pounds of cotton material consumed in the production of cotton goods during the year 1909 was $274,724,210. The total value of the cotton goods produced from these materials was $628,391,813, divided as follows: 6,348,568,593 square yards of woven goods, valued at $456,089,401; 23,700,957 pounds of thread, valued at $20,516,269; and 13,715,771 pounds of twine, valued at $2,417,391. There were 27,425,608 producing spindles used during the year, and 665,049 looms of all classes.



CHIEF MANUFACTURING COUNTRIES.
(Number of Spindles).

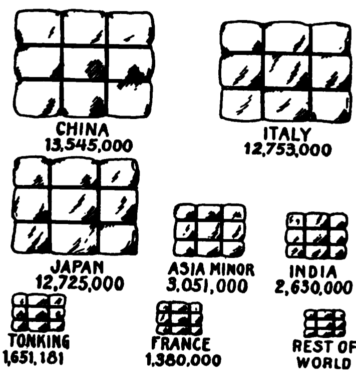
THE MAGNITUDE OF THE COTTON INDUSTRY, FROM COTTON BOLL TO FINISHED PRODUCT.

Oilcloth and Linoleum.

The total value of the oilcloth and linoleum produced in the United States during the year 1909 was $26,253,796. The oilcloth, valued at $11,681,012, was divided as follows: 18,354,851 square yards of floor oilcloth, valued at $3,776,660; 17,338,440 square yards of enameled oilcloth, valued at $2,265,-146; 61,168,777 square yards of table oil-cloth, valued at $5,639,206. The total value ol the linoleum produced in the United States during the same period was $10,844,928. The value of the artificial leather produced in the United States during the same period was $3,448,617.

Silk and Silk Goods.

The total cost of the materials used in the production of the silk products of the United States was $107,766,916. There were 17,-472,204 pounds of raw silk, valued at $67,-787,037, required; 2,212,972 pounds of spun silk, valued at $4,848,789, used; 914,494 pounds of artificial silk, valued at $1,926,894; 3,377,972 pounds of organzine and tram, valued at $14,679,719, purchased; $1,637,187 dollars worth of fringe and floss, including waste, noils, etc.; 14,111,878 pounds of cotton and mercerized yarn, valued at $5,811,582; 610,588 pounds of woolen or worsted yarns, valued at $765,989; 710,108 pounds of mohair yarn valued at $640,529; and 353,780 pounds of all other kinds of yarn, valued at $456,597. Chemicals and dyestuffs, cost $1,062,313; and all other materials used in the production of silk and silk goods cost $8,150,280.



SILK.
A YEAR'S PRODUCTION.

The products of the silk and silk goods industry in the United States during the year 1909 were valued at $106,911,667. Of this amount $107,881,146 were derived from the manufacture of 185,707,316 yards of broad silk, as follows: $53,282,704 from the manu-facture of 81,934,158 yards of all silk, plain and fancies; $14,207,861 from the 24,742,556 yards of silk mixed, plain and fancies; $9,835,-345 from the 13,249,090 yards of all silk jac-quard; $3,473,799 from the 6,043,686 yards of silk mixed jacquard; $11,353,242 from the 19,693,393 yards of all piece-dyed broad silk, and $15,728,195 from the 40,044,433 yards of mixed piece-dyed broad silk; $4,767,990 from the 10,093,583 yards of velvet; $2,104,-768 from the 2,759,411 yards of plushes; $382,820 from the 226,717 yards of tapestries and upholstery; $32,744,873 from ribbons; $1,350,850 laces, nets, veils, veiling, etc.; $485,322 from embroideries; $824,527 from fringes and gimps; $4,483,248 from braids and bindings; $3,850,448 from trimmings; $6,341,719 from the 1,088,780 pounds of machinist twine; $4,179,355 from the 747,246 pounds of sewing, embroidery, wash, fringe and floss silks; $12,550,510 from the 2,740,319 pounds of organzine and tram; and $2,104,066 from the 779,462 pounds of spun silk. The value of all other products of the silk and silk goods industries amounted to $4,495,675; and the value of all the work done on materials for others amounted to $8,364,350.

Woolen and Worsted Goods.

The total cost of all the materials required in the manufacture of all the woolen and worsted goods produced in the United States during the year 1909 amounted to $273,438,-570. This amount was divided as follows: 474,755,366 pounds of wool in the condition purchased, value $136,666,917, of which 310,602,279 pounds were domestic wool, with a value of $85,018,238, and 164,153,087 pounds were foreign wool, with a value of $51,648,679; mohair, camel, alpaca and vicuna hair, 7,805,422 pounds, value $2,399,123; cow and other animal hair, 17,356,100 pounds, value $932,911; cotton, 20,024,061 pounds, value $2,515,409; tailors' clippings, rags, etc., 40,402,460 pounds, value $2,856,966; shoddy, mungo and wool extract purchased, 21,454,187 pounds, value $3,058,-214; waste and noils of wool, mohair, camel hair, etc., purchased, 26,473,311 pounds, value $7,523,283; tops purchased, 20,828,245 pounds, value $14,614,527; woolen yarns purchased, 931,222 pounds, value $558,270; worsted yarns purchased, 59,148,771 pounds, value $56,033,701; merino yarns purchased, 1,971,709 pounds, value $318,456; cotton yarns purchased, 39,169,388 pounds, value $10,492,185; silk and spun silk yarns, 282,536 pounds, value $1,142,663; all other yarns, 1,046,735 pounds, value $40,739; chemicals and dyestuffs, value $8,820,928; and all other materials, value $25,464,278.

The total value of all the products of the woolen and worsted goods manufactories was $419,743,521. This amount was derived from the following products: All-wool woven goods, 322,944,365 square yards, value $219,853,767; wool cloths, doeskins, cassimeres, cheviots, etc., 40,843,979 square yards, value $29,-291,059; worsted coatings, serges and suitings, 119,655,069 square yards, value $101,903,153; woolen overcoatings, 14,697,770 square yards, value $11,230,856; worsted overcoatings and cloakings, 654,404 square yards, value $821,688; wool dress goods, sackings, tricots, etc., and opera and similar flannels, 29,099,-956 square yards, value $16,385,498; worsted dress goods, cashmeres, serges, bunting, etc., 105,801,349 square yards, value $54,030,376; carriage cloths, 1,782,855 square yards, value $947,862; flannels for underwear, 3,856,553

square yards, value $1,257,271; blankets, 5,137,903 square yards, value $3,228,797; horse blankets, 247,395 square yards, value $185,430; woven shawls, 704,153 square yards, value $404,583; and all other all-wool woven goods, 463,179 square yards, value $167,194; union, or cotton mixed, woven goods, 37,453,351 square yards, value $14,327,973; unions, tweeds, cheviots, cassimeres, etc., 18,917,478 square yards, value $7,780,854; overcoatings and cloakings, 4,281,739 square yards, value $2,363,381; sackings, tricots, dress goods and opera and similar flannels, 4,319,539 square yards, value $1,776,721; flannels for underwear, 7,063,572 square yards, value $1,308,369; blankets, 1,717,758 square yards, value $650,714; all other union, or cotton mixed, woven goods, 1,153,265 square yards, value $447,934; all cotton-warp woven goods, 210,346,081 square yards, value $62,265,854; all upholstering goods and sundries, value $1,986,330; all partially manufactured products for sale, value $115,032,285; all other products, value $3,250,857. During the year there were 4,287,640 spindles, producing and doubling and twisting; also, 72,532 looms, all classes.

IV. IRON AND STEEL MANUFACTURES.

	1909
MATERIALS.	
Total cost	$320,637,889
Iron ore:	
Tons	48,353,677
Cost	$187,264,601
Domestic—	
Tons	46,605,930
Cost	$177,589,789
Foreign—	
Tons	1,747,747
Cost	$9,674,812
Mill cinder, scrap, etc.:	
Tons	1,982,530
Cost	$5,544,859
Fluxes:	
Tons	13,570,845
Cost	$12,239,493
Fuel, total cost [2]	$105,994,112
Coke—	
Tons (2,000 pounds)	31,436,536
Cost	$102,134,423
Charcoal—	
Bushels	38,032,618
Cost	$2,787,026
Anthracite coal [2]—	
Tons	265,401
Cost	$904,102
Bituminous coal [2]—	
Tons	102,833
Cost	$168,561
All other materials, cost	$9,594,824
PRODUCTS.	
Total value	$391,429,283
Pig iron:	
Tons	25,651,798
Value	$387,830,443
All other products, value	$3,598,840
Pig iron, classified according to fuel used:	
Bituminous, chiefly coke—	
Tons	[3] 24,608,572
Value	$369,684,636
Anthracite coal and coke mixed and anthracite alone—	
Tons	670,991
Value	$10,962,150
Charcoal—	
Tons	372,235
Value	$7,183,657
Pig iron, classified according to disposition:	
Produced for consumption in works of company reporting—	
Tons	15,858,203
Value	$239,387,017
PRODUCTS—continued.	
Pig iron, classified according to disposition—Continued.	
Produced for sale—	
Tons	9,793,595
Value	$148,443,426
Pig iron, classified by grades (tons):	
Bessemer, (0.04 to 0.10 per cent in phosphorus)	10,147,052
Low phosphorus (below 0.04 per cent in phosphorus)	248,720
Basic	7,741,759
Foundry	5,539,410
Forge or mill	586,685
Malleable Bessemer	934,211
White, mottled, and miscellaneous	110,810
Direct castings	16,181
Ferro alloys	326,970
Spiegeleisen	142,223
Ferromanganese	82,208
Ferrosilicon, including Bessemer ferrosilicon (7 per cent or over in silicon) and ferrophosphorus	102,539
Pig iron, classified by method of delivery or casting (tons):	
Delivered in molten condition	12,197,686
Sand cast	7,655,568
Machine cast	5,096,797
Chill cast	685,566
Direct castings	16,181
EQUIPMENT.	
Furnaces in active establishments:	
Completed stacks at end of year—	
Number	388
Daily capacity, tons	101,447
Active during the year—	
Number	370
Daily capacity, tons	98,973
In course of construction at end of year—	
Number	10
Daily capacity, tons	4,100
Pig-casting machines, number	104
Granulated slag pits:	
Number	85
Annual capacity, tons	5,699,259
Gas engines operated with blast-furnace gas:	
Number	85
Horsepower	198,040

IRON AND STEEL.

	1909
I. MATERIALS.	
Total cost	$657,500,856
Iron and steel:[1]	
For furnaces and hot rolls—	
Tons	30,388,755
Cost	$515,769,588
Pig iron and ferroalloys—	
Tons	19,076,889
Cost	$297,471,122
Pig iron—	
Tons	18,712,304
Cost	$282,663,740
Ferroalloys—spiegeleisen, ferromanganese, etc.—	
Tons	364,585
Cost	$14,807,382
Scrap, including old rails not intended for rerolling—	
Tons	4,803,617
Cost	$72,722,831
Ingots, blooms, billets, slabs, muck and scrap bar, rerolling rails, and sheet and tin-plate bars—	
Tons	6,508,249
Cost	$145,575,635
Rolled forms for further manufacture—	
Skelp—	
Tons	176,717
Cost	$5,704,856
Wire rods—	
Tons	146,425
Cost	$4,252,695
Iron ore:	
Tons	835,338
Cost	$4,292,963
All other materials, cost	$127,480,754
II. PRODUCTS	
Total value	$985,722,534
Rolled, forged, and other classified products, steel and iron:	
Tons	26,723,274
Value	$863,342,711
Rails—	
Tons	2,858,599
Value	$81,128,295
Bessemer steel—	
Tons	1,643,527
Value	$44,727,515
Open-hearth steel, basic—	
Tons	1,215,072
Value	$36,400,780
Rerolled or renewed rails—	
Tons	106,352
Value	$2,683,017
Rail fastenings (splice bars, tie-plates, fishplates, etc.)—	
Tons	396,911
Value	$14,488,412
Structural shapes, not including plates used for making girders—	
Tons	2,123,630
Value	$65,564,593
Steel—	
Tons	2,102,300
Value	$64,853,466
Open-hearth—	
Tons	1,934,230
Value	$59,789,948
Bessemer—	
Tons	168,070
Value	$5,063,518
II. PRODUCTS—continued.	
Iron—	
Tons	21,330
Value	$711,127
Bars and rods, including merchant, shovel, finger, and horseshoe bars, spike, chain, bolt, and nut rods, etc. (but not including wire rods, sheet and tin-plate bars, splice bars, and bars for reenforced concrete):	
Tons	3,784,248
Value	$121,488,423
Bars for reenforced concrete:	
Tons	191,358
Value	$5,588,963
Wire rods:	
Tons	2,295,279
Value	$61,947,958
Plates and sheets, not including black plates or sheets for tinning, nail and tack plates, tie-plates, fishplates, or armor plates:	
Tons	3,332,733
Value	$133,272,393
Black plates, or sheets, for tinning:	
Tons	631,435
Value	$30,955,967
Skelp, flue and pipe:	
Tons	2,084,286
Value	$64,514,728
Hoops, bands, and cotton ties:	
Tons	341,043
Value	$10,429,681
Nail and tack plates:	
Tons	68,557
Value	$2,540,022
Axles, car, locomotive, automobile, wagon, carriage. etc., rolled or forged:	
Tons	102,348
Value	$3,831,344
Armor plates, gun forgings, and ordnance:	
Tons	26,845
Value	$10,649,079
Blooms, billets, and slabs, produced for sale or for transfer to other works of same company:	
Tons	4,887,796
Value	$108,514,747
Rolled forging blooms and billets produced for sale or for transfer to other works of same company:	
Tons	84,383
Value	$2,247,133
Sheet and tin-plate bars produced for sale or for transfer to other works of same company:	
Tons	1,652,761
Value	$37,745,269
Muck and scrap bar produced for sale or for transfer to other works of same company:	
Tons	174,496
Value	$4,966,211
All other rolled steel or iron:	
Tons	566,627
Value	$39,570,061

IRON AND STEEL—Continued.

	1909
II. PRODUCTS—continued.	
Rolled, forged, and other classified products, steel and iron—Continued.	
Ingots produced for sale or for transfer to other works of same company:	
Tons	142,745
Value	$3,593,726
Direct steel castings:	
Tons	504,856
Value	$38,862,448
All other forged steel and iron, not including remanufactures of rolling-mill products:	
Tons	365,986
Value	$18,740,241
All other products, value	$122,379,823
Miscellaneous steel and iron products not rolled, including value added to iron and steel rolling-mill products by further manufacture, value	$86,534,369
Scrap steel or iron produced for sale or for transfer to other works of same company:	
Tons	1,238,554
Value	$18,163,624
All products other than steel and iron, value	$17,681,830
III. STEEL.	
Total production:	
Tons	[a] 23,473,718
Value (included above)	$478,736,988
Classified according to process:	
Open-hearth—	
Tons	14,176,054
Value	$292,360,129
Basic—	
Tons	13,210,419
Value	$262,529,822
Acid—	
Tons	965,635
Value	$29,830,307
Bessemer—	
Tons	9,190,291
Value	$178,232,848
Crucible and miscellaneous—	
Tons	107,373
Value	$8,144,011
Classified according to form:	
Ingots—	
Tons	22,968,862
Value	$439,874,540
Castings—	
Tons	504,856
Value	$38,862,448
Duplex process—open-hearth steel partly purified in Bessemer converters before finishing in open-hearth furnaces (included above), tons	522,682
Alloyed steels, nickel, tungsten, titanium, chrome, vanadium, etc. (included above), tons	158,216
Classified according to process:	
Open-hearth	100,335
Basic	86,242
Acid	14,093
Bessemer	45,324
Crucible and miscellaneous	12,557
Classified according to form:	
Ingots	151,300
Castings	6,916

	1909
IV. MANUFACTURES FROM ROLLING-MILL PRODUCTS.	
(Made in mill producing, value previously included.)	
Wire and wire products:	
Tons (2,000 pounds)	1,634,855
Value	$71,624,024
Pipes and tubes:	
Wrought welded—	
Tons	1,314,771
Value	$66,471,573
Seamless, hot-rolled or drawn—	
Tons	54,273
Value	$5,650,739
All other, including clinched, riveted, etc., but not including cast:	
Tons	17,561
Value	$986,699
Bolts, nuts, rivets, forged spikes, washers, etc.:	
Kegs (200 pounds)	4,471,965
Value	$20,538,858
Cut nails and spikes:	
Kegs (100 pounds)	1,009,319
Value	$2,218,207
Horse and mule shoes:	
Kegs (200 pounds)	996,383
Value	$7,202,897
Springs, car, furniture, and all other, not including wire springs:	
Tons	6,191
Value	$374,924
Switches, frogs, crossings, etc.:	
Tons	28,608
Value	$2,471,008
Galvanized plates or sheets:	
Tons	431,658
Value	$25,912,056
Stamped ware:	
Tons	24,612
Value	$2,296,707
Shovels, spades, scoops, etc., value	$540,321
V. PRODUCTS SOLD FOR EXPORT.	
(By establishments producing.)	
Total tons	867,646
Rails	317,455
Rail fastenings	20,118
Pipes and tubes	89,377
Sheet and tin-plate bars	85,123
Plates and sheets	80,706
Galvanized plates or sheets	79,246
Structural shapes	69,764
Bars and rods	48,938
Wire rods	18,738
Blooms, billets, and slabs	18,021
Skelp	10,703
Miscellaneous	29,457
VI. EQUIPMENT.	
Steel plants: Daily capacity of steel furnaces and converters, tons of steel, double turn	108,716
Open-hearth furnaces—	
Number	687
Daily capacity, tons of steel, double turn	61,601
Basic—	
Number	549
Daily capacity, tons of steel, double turn	55,273
Acid—	
Number	138
Daily capacity, tons of steel, double turn	6,328

IRON AND STEEL—Continued.

	1909
VI. EQUIPMENT. —continued.	
Converters, Bessemer or modified Bessemer—	
Number	99
Daily capacity, tons of steel, double turn	45,983
Crucible furnaces—	
Number	257
Number of pots that can be used at a heat	3,840
Daily capacity, tons of steel, double turn	840
All other steel furnaces—	
Number	16
Daily capacity, tons of steel, double turn	292
Metal mixers—	
Number	59
Capacity, tons	14,343
Rolling mills: Daily capacity of rolled steel and iron, double turn, tons	150,403

PRODUCTION OF COKE.

The total cost of the materials used in the production of coke, was $65,388,124. The cost of the coal charged into ovens, was $59,354,937. The total value of the coke produced, was $98,078,383; 39,315,065 tons were valued at $89,965,483. Among by-products obtained in the manufacture of coke was gas, which measured in thousands of cubic feet, amounted to 76,590,763 of which 60,799,543 cubic feet (thousands) were used in process or wasted and 15,791,220 cubic feet (thousands) were sold at a value of $2,609,211. 60,126,006 gallons of tar were obtained having a value of $1,408,611; of sulphate ammonia, or its equivalent in sulphate, 123,111,197, valued at $3,227,316. At the end of the year 1909, the number of ovens in use in the United States was 103,982. 201 had been abandoned during the year, and 2,950 were building.

Coal seems to have been used for fuel by the ancient Britons, but the first proper notice we have is that it was mined in Newcastle 1233.

AGRICULTURAL IMPLEMENTS.

PRODUCT.	1909
Total value	[1]$146,329,268
Implements of cultivation	$35,246,030
Seeders and planters	$13,679,921
Harvesting implements	$34,568,131
Seed separators	$11,030,412
All other products	$48,690,082
Amount received for repair work	$3,114,692
Principal kind of implements, by number.	
Implements of cultivation:	
Cultivators—	
Beet	3,172
Small	469,696
Wheeled	435,429
Cotton scrapers	20,180
Harrows—	
Disk	193,000
Spring-tooth	112,832
Spike-tooth	394,988
Listers	44,840
Plows—	
Disk	22,132
Gang	91,686
Shovel	254,737
Steam	2,355
Sulky or wheel	134,936
Walking	1,110,006
Seeders and planters:	
Seeders—	
Broadcast	38,007
Combination	23,963
Corn planters—	
Hand	96,465
Horse	122,780
Cotton planters	79,271
Potato planters	23,092
Drills— continued.	
Corn	20,137
Disk	21,292
Grain	68,611
All other	32,507
Seed sowers	7,847
Harvesting implements:	
Grain cradles	22,635
Harvesters—	
Bean	1,409
Corn	19,693
Grain	129,274
Harvesters and thrashers combined	543
Other	1,707
Hay carriers	45,064
Hayforks, horse	43,675
Hay loaders	34,705
Hayrakes, horse	266,260
Haystackers	17,212
Hay tedders	34,396
Mowers	359,264
Potato diggers, horse	25,632
Reapers	58,294
Seed separators:	
Clover hullers	437
Corn huskers	372
Corn huskers and shredders	1,240
Corn shellers—	
Hand	74,223
Power	9,049
Fanning mills	33,805
Thrashers—	
Horsepower	822
Steam power	23,586

The total cost of the materials used in the manufacture of Glucose and Starch was $36,898,771. The total value of the manufactured products was $48,799,311; 677,535,647 pounds of starch were valued at $17,514,823; 769,660,210 pounds of glucose, including all sirups, valued at $17,922,514; 159,060,478 pounds grape sugar, valued at $3,620,816; 8,164,175 gallons corn oil, valued at $2,802,763.

TIN AND TERNE PLATE.

	1909
MATERIALS.	
Total cost	$41,889,434
Black plates or sheets:	
Pounds	[1] 1,321,071,691
Cost	$28,981,151
Produced by the establishment reporting:	
Pounds	1,291,048,109
Cost	$28,245,234
Purchased:	
Pounds	30,023,582
Cost	$735,917
Coating metals:	
Pounds	40,927,759
Cost	$9,670,037
Tin, including tin contents of terne mixture purchased—	
Pounds	31,077,651
Cost	$9,235,718
Lead, including lead contents of terne mixture purchased—	
Pounds	9,850,108
Cost	$434,319
In condition purchased—	
Pig tin—	
Pounds	28,586,267
Cost	$8,490,794
Pig lead—	
Pounds	2,708,496
Cost	$117,656
Terne mixture—	
Pounds	9,632,996
Cost	$1,061,587
All other materials, cost	$3,238,246
PRODUCTS.	
Total value	[7] $47,969,645
Tin and terne plates:	
Pounds	1,315,313,132
Value	$45,815,146

	1909
PRODUCTS—continued.	
Tin plates—	
Pounds	1,123,968,875
Value	$38,259,885
Terne plates—	
Pounds	191,344,257
Value	$7,555,261
Other sheet iron or sheet steel tinned or terne-plated, taggers tin, etc.:	
Pounds	19,400,934
Value	$520,465
All other products, value	$1,634,034
EQUIPMENT.	
Tin or terne sets at end of year:	
Completed—	
Number	563
Usually employed on tin plates	450
Usually employed on terne plates	113
Daily capacity, single turn, pounds	2,795,972
Tin plates	2,055,915
Terne plates	740,057
Daily capacity as operated, whether on single, double, or triple turn, pounds	7,016,293
Building, number	49
Black-plate department of establishments making their black plates:	
Hot black-plate mills at end of year—	
Completed—	
Number	335
Annual capacity on triple turn, long tons	1,042,088
Building—	
Number	20
Annual capacity on triple turn, long tons	36,600
Cold mills, completed, number	268

WIRE.

The value of the metal used in the production of wire, amounted to $115,655,427, while the total value of the products was $180,083,522. There were produced 2,471,858 tons of steel and iron wire, having a value of $120,585,637. There were also produced 13,926,861 kegs of wire nails and spikes, allowing 100 pounds to each keg, the total value being $27,575,774. There were also produced 28,125 tons of wire brads, tacks and staples, having a value of $1,324,170. The quantity of barbed wire manufactured was 323,565 tons, valued at $13,881,517; woven wire, fencing, and poultry netting, had a tonnage of 422,127, valued at $21,419,170; wire rope and strands had a tonnage of 45,303, the value being $6,683,771; other manufactures of iron and steel wire, such as springs, bale ties, flat wire, etc., weighed 129,945 tons, and cost $10,856,154.

There were produced in the United States in 1909, 154,231 tons of copper wire, valued at $47,184,164. The equipment consisted of 43,697 wire drawing blocks, having an annual capacity of 3,213,574 tons; 4,428 wire nail machines, having an annual capacity of 18,756,995 kegs of 100 pounds each. There were 446 woven-wire fence machines, having an annual capacity, in tons, of 481,373.

The total value of the steel and iron wire products, 1909, was $120,585,637; the wire mills were valued at $47,934,204; the wire departments of rolling mills produced 1,649,929 tons, valued at $72,651,433.

PRODUCTION OF SOAP.

The total cost of the materials used in the manufacture of this product in the United States in 1909 was $72,179,418. Of tallow, grease, and other fats, 413,969,787 pounds were consumed, costing $23,341,905; 11,856,837 gallons of cocoanut and palm-kernel oil, costing $5,875,294; 24,221,712 gallons cottonseed oil, costing $9,718,988; 207,296,447 pounds of rosin, costing $4,362,412; 94,050,892 pounds hoofs, costing $2,453,609; 52,172 tons (2,000 pounds) caustic soda, costing $2,212,232; 121,016 tons (2,000 pounds) soda ash, costing $2,281,787.

The total value of the soap products of the United States in 1909 was $111,357,777. 1,736,740,466 pounds of hard soap were made, valued at $88,550,830; 44,052,615 pounds of soft soap, valued at $943,676; 39,689,300 pounds of glycerin, valued at $5,713,558.

V. TRANSPORTATION.

Railroad Cars.

The total value of all railroad cars constructed in all establishments throughout the United States, in 1909, was $102,137,396. The value of the steam-railroad cars was $94,874,287: Of these for passenger service were built 1,819 cars, valued at $15,120,961; for freight service, 96,648 cars, valued at $79,753,326. Of street-railroad cars, which were chiefly electric, there were built 2,772 cars, valued at $7,263,109.

Steam-Railroad Cars.

The total value of the products of this industry in the United States, in 1909, was $123,729,627. Of steam-railroad cars for the passenger service there were constructed 1,601 cars, valued at $13,829,607: of this class there were built 216 baggage and express cars, valued at $1,105,779; 95 mail cars, valued at $600,912; 957 passenger cars, valued at $7,209,425; the chair, dining and buffet, parlor, sleeping, and all other cars, amounted to 333, valued at $4,913,491. For the freight service the number of cars constructed, totaled 73,177, valued at $61,691,825; Of these there were 29,728 box cars, valued at $23,982,446; 11,473 coal and coke, valued at $9,419,655; 3,232 flat cars, valued at $2,033,801; 900 fruit cars, valued at $784,476; 90 furniture cars, valued at $70,515; 19,607 gondola or ore, valued at $18,128,186: 2,618 refrigerator cars, valued at $2,747,957; 2,349 stock cars, valued at $1,586,008; 537 caboose, valued at $525,605; 2,643 other cars, valued at $2,413,176. There were also built 603 street-railroad cars, valued at $2,023,922: Of these 558 were passenger cars, valued at $1,903,317; 45 other cars, valued at $120,605.

Cars and General Shop Construction and Repairs by Steam Railroad Companies.

The cars and general shop construction and repairs made by the steam railroad companies in 1909, reached a total of $405,600,727. The value of the car department was $199,768,939. The value of the cars built was $13,326,171: Of these there were 218 passenger cars, valued at $1,291,354; 13,972 freight cars, valued at $11,767,664; the number of all other cars manufactured was 359, valued at $267,153. Repairs to cars of all kinds amounted to $147,194,065.

Cars, Street-Railroad.

The total value of the products of this industry in the United States, in 1909, was $7,809,866. There were constructed 1,922 electric-railroad cars, valued at $4,602,435: Of these there were 1,323 closed cars, valued at $3,500,781; 369 combination cars, valued at $704,309; 95 open cars, valued at $141,008; 92 freight, express, and mail cars, valued at $179,293; of all other varieties, 43, valued at $77,044. There were steam-railroad cars built for freight service, 167, all classes—valued at $111,813.

Shipbuilding, Including Boat Building.

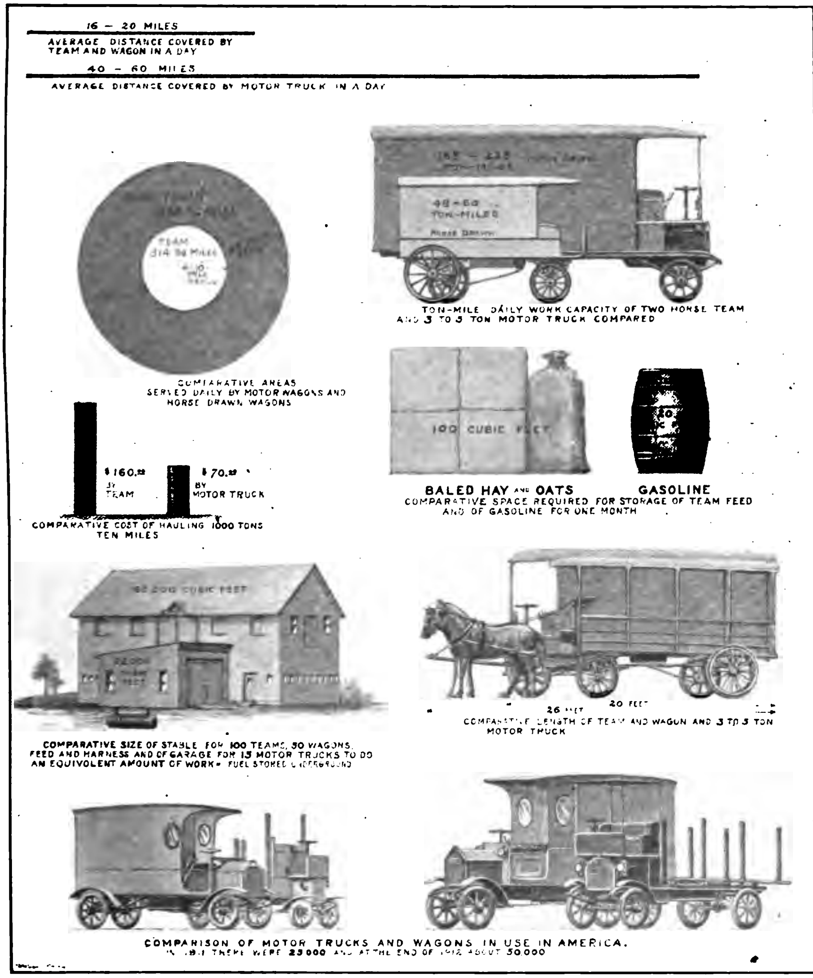
The total value of work done on the different classes of water craft, not in Government establishments, the value of the repair work, and all other products of the shipbuilding industry, in 1909, was $73,360,315. Work done during the year on vessels and boats, amounted to $42,310,925; vessels of 5 gross tons and over, $37,718,018; boats of less than 5 gross tons, $4,592,907; repair work, $26,678,643.

Bicycles, Motorcycles, and Parts.

The total value of bicycles and motorcycles, and parts, manufactured in the United States in 1909, was $10,698,567. 168,824 bicycles were manufactured, valued at $2,436,996; 18,628 motorcycles were made, their value being $3,015,988.

AUTOMOBILE INDUSTRY.

PRODUCT.	1909	
	Number.	Value.
Total value	....	[1] $249,202,075
Automobiles	126,593	164,269,324
Gasoline	120,393	153,529,653
Electric	3,826	7,259,430
Steam	2,374	3,480,241
Passenger vehicles (pleasure, family, and public conveyances)	123,338	159,039,301
Gasoline	117,633	149,530,232
Electric	3,331	6,028,828
Steam	2,374	3,480,241
Buggies	4,582	2,391,250
Gasoline	4,314	2,039,129
Electric	268	352,121
Runabouts	36,204	28,030,479
Gasoline	35,347	27,116,901
Electric	496	648,630
Steam	361	264,948
Touring cars	76,114	113,403,186
Gasoline	73,883	109,844,295
Electric	243	387,526
Steam	1,988	3,171,367
Closed (limousine, cabs, etc.)	5,205	12,729,304
Gasoline	3,290	8,762,768
Electric	1,915	3,966,536
All other (omnibuses, sight-seeing wagons, ambulances, patrol wagons, etc.)	1,233	2,485,080
Gasoline	799	1,767,139
Electric	409	674,015
Steam	25	43,926
Business vehicles (merchandise)	3,255	5,230,023
Gasoline	2,760	3,999,421
Electric	495	1,230,602
Steam	....	....
Delivery wagons	1,862	1,918,856
Gasoline	1,645	1,474,063
Electric	217	444,793
Steam	....	....
Trucks	1,366	3,165,512
Gasoline	1,090	2,384,703
Electric	276	780,809
All other	27	145,655
Gasoline	25	140,655
Electric	2	5,000
All other products, including bodies and parts	....	[2] 78,584,753
Amount received for custom work and repairing	....	6,317,998



THE GREATER EFFICIENCY OF THE MOTOR TRUCK AS COMPARED WITH THE EFFICIENY OF THE HORSE-DRAWN WAGON.

Carriages and Wagons and Materials.

The total value of carriages and wagons and materials manufactured in the United States, in 1909, was $159,892,547. Of carriages (family and pleasure) there were made 828,411, valued at $47,756,118; 587,685 wagons, valued at $39,932,910, were manufactured; of these 154,631 were business wagons, their value being $16,440,816; 429,952 farm wagons, valued at $22,615,875; the remainder, government, municipal, etc., 3,102, valued at $876,219. Of public conveyances (cabs, hacks, hansoms, hotel coaches, omnibuses, etc.), 2,243 were manufactured, valued at $939,267; 100,899 sleighs and sleds, valued at $2,065,850.

Cars and General Shop Construction and Repairs by Street-Railroad Companies.

The cars and general shop construction and repairs by street-railroad companies in 1909, reached a total value of $31,962,561. The value of the motive power and machinery department, was $4,510,332. The value of the repairs to motors, etc., was $4,004,336. The value of the car department was $25,835,463. The value of all the cars built was $626,752: Of these there were 129 passenger cars, valued at $498,709; 63 freight cars, valued at $59,102; of all other cars there were 51 built, valued at $68,941.

VI. CLAY AND STONE PRODUCTS.

The total value of these products for the year 1909, was $168,895,365. The value of the brick and tile, terra-cotta, and fire-clay products, was $136,387,846; of common brick there were 9,787,671 thousand, valued at $57,216,789; of fire brick, 838,167 thousand, valued at $16,620,695; of the vitrified, paving, etc., 1,023,654 thousand, valued at $11,269,586; front, including fancy colored and fancy or ornamental brick, 821,641 thousand, valued at $9,886,292; the sand lime brick used had a value of $1,150,580; the enameled brick were valued at $993,902; the value of the drain tile was $9,798,978; the sewer pipe used was valued at $10,322,324; the value of the architectural terra-cotta was $6,251,625; the fireproofing, terra-cotta lumber and hollow building tile, or blocks, was valued at $4,466,708; the value of the tile, not drain, was $5,291,963; the value of the stove lining was $423,583; other material, valued at $2,694,821. The value of the pottery manufactured was $31,048,341.

Building Operations.

In 1912 the total cost of buildings, according to reports of municipal authorities to the Bureau of Statistics, was $683,506,372 against $702,143,956 in 1911, and $726,436,975 in 1910. The total number of permits for 1911 was 192,978.

Cement.

The total value of the cement product in 1909, for the United States, was $63,205,455. There were manufactured 66,689,715 barrels of cement, valued at $53,610,563; of this 64,991,431 barrels was Portland, valued at $52,858,354; 1,537,638 was natural, valued at $652,756; 160,646 barrels puzzolan, valued at $99,453. The value of all other products of this industry, was $9,594,892.

Glass.

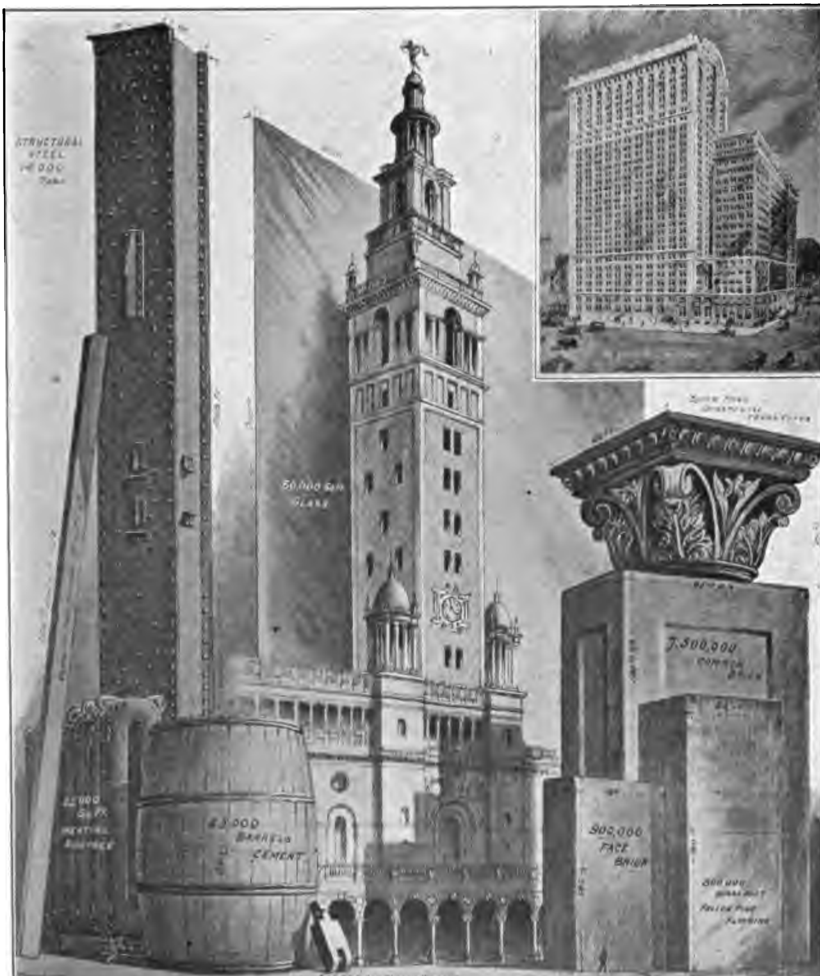
The total cost of the materials used in the manufacture of glass, in 1909, amounted to $32,119,499, while the total value of these products was $92,095,203 Of this amount the value of building glass aggregated $26,308,438; included under this head are 6,921,611 50-foot boxes of window glass, valued at $11,742,959; also included in this division is plate glass, of which there was cast a total of 60,105,694 square feet; of this amount 47,370,254 square feet was polished glass, valued at $12,204,875; the remainder, rough glass, made for sale,—205,690 square feet, valued at $37,431. Of cathedral glass there were 7,405,980 square feet, valued at $569,848; 15,409,966 square feet of skylight glass, valued at $788,726. The value of the pressed and blown glass was $27,398,445; Of this goods there was manufactured tableware, 100 pieces, 1,286,056 sets; jellies, tumblers, and goblets, 11,687,036 dozen; lamps, 322,482 dozen; chimneys, 6,652,967 dozen; lantern globes, 952,620 dozen; globes and other electrical goods, 11,738,798 dozen; shades, globes, and other gas goods, 1,541,449 dozen; blown tumblers, stem ware, and bar goods, 9,182,060 dozen; opal ware, 3,095,666 dozen; cut ware, 206,336 dozen. The value of the bottles and jars manufactured, was $36,018,333. Of prescriptions, vials, and druggists' wares, 3,624,022 gross were made; 2,345,204 gross of beer, soda and mineral glassware; 1,887,344 gross of liquors and flasks; 440,302 gross milk jars; 1,124,485 gross fruit jars; of battery jars and other electrical goods, 9,981 gross; of patent and proprietary glassware, 1,637,798 gross; of packers and preservers, 1,237,175 gross; of demijohns and carboys, 122,570 dozen.

Artificial Ice.

The total cost of the materials used in establishments for the manufacture of ice, in 1909, was $1,021,913. By the compressor system there were used 3,097,191 pounds of anhydrous ammonia, costing $826,222. By the absorption system there were used 369,093 pounds of anhydrous ammonia, valued at $100,283. There were also used 1,670,698 pounds of aqua ammonia, valued at $95,408.

The total value of the ice products for the year 1909 was $42,953,055. Of the ice itself there was 12,647,949 tons (2,000 pounds each), valued at $39,889,263: Of the can ice, 11,671,547 tons (2,000 pounds), valued at $37,085,533; of the plate ice, 976,402 tons (2,000 pounds), valued at $2,803,730.

The first permanent electric railway was operated near Berlin in 1881, and the first permanent elevated electric railway was operated in Chicago 1895.



A MAMMOTH OFFICE BUILDING DISSECTED.

THE WHITEHALL BUILDING.

VII. LEATHER INDUSTRY.

	1909
MATERIALS.	
Total cost	$248,278,933
Tanning.	
Hides[1] (all kinds):	
Number	[2] 18,360,415
Cost	$119,410,767
Skins: [1]	
Number	97,680,571
Cost	$75,647,790
Calf and kip—	
Number	19,732,638
Cost	$31,790,572
Goat—	
Number	48,077,664
Cost	$27,833,214
Sheep—	
Number	26,082,060
Cost	$12,231,618
All other—	
Number	[3] 3,788,209
Cost	$3,792,386
Currying.	
Purchased rough leather used, cost	$9,556,257
Sides—	
Number	1,468,213
Cost	$4,967,781
Grains—	
Sides	525,786
Cost	$1,201,842
Splits—	
Number	2,043,283
Cost	$1,442,505
All other—	
Cost	$1,944,129
All other materials, cost	$43,664,119
PRODUCTS.	
Total value	[4] $327,874,187
Leather, value	$306,476,720
Sold in rough, value	$6,335,599
Sides—	
Number	828,887
Value	$3,539,617
Grains—	
Sides	317,814
Value	$718,562
Splits—	
Number	2,912,964
Value	$2,077,420
Sole, value	$88,331,713
Hemlock—	
Sides	7,963,728
Value	$32,237,151
Oak—	
Sides	3,805,861
Value	$26,083,793
Union—	
Sides	5,756,227
Value	$28,375,815
PRODUCTS—continued.	
Leather—Continued.	
Sole—Continued.	
Chrome—	
Sides	279,436
Value	$1,634,954
Upper, other than calf or kip skins, value	$39,951,460
Grain, satin, pebble, etc. (side leather)—	
Sides	7,946,769
Value	$24,198,993
Finished splits—	
Number	8,134,229
Value	$7,410,740
Patent and enameled shoe—	
Sides	2,705,291
Value	$8,341,727
Horsehides and coltskins—	
Number	1,342,938
Value	$4,953,145
Calf and kip skins, tanned and finished—	
Number	19,012,064
Value	$42,412,256
Grain finished—	
Number	17,516,910
Value	$39,982,447
Flesh finished—	
Number	1,495,154
Value	$2,429,809
Goatskins, tanned and finished—	
Number	47,907,211
Value	$40,882,640
Black—	
Number	40,351,192
Value	$33,949,575
Colored—	
Number	7,556,019
Value	$6,933,065
Sheepskins, tanned and finished—	
Number	19,665,155
Value	$12,236,687
Belting—	
Sides	1,042,070
Value	$6,995,133
Harness—	
Sides	3,946,235
Value	$24,802,734
Carriage, automobile, and furniture—	
Sides	1,398,842
Value	$14,266,742
Trunk, bag, and pocketbook, value	$6,198,544
Bookbinder's, value	$2,450,155
Glove, value	$4,913,543
All other, value	$11,746,369
All other products, value	$8,632,689
Work on materials for others	$12,764,778

THE GREAT GLASS INDUSTRY OF THE U. S. AMOUNTING TO $92,000,000.

Boots and Shoes.

In 1909 there were produced in the United States 247,643,197 pairs of boots and shoes. The classification of this product was as follows,—Men's, 93,888,892; boys' and youths', 23,838,626; women's, 86,595,314; misses' and children's, 43,320,365. Of slippers there were manufactured 17,507,834 pairs, distributed as follows,—Men's, boys' and youths', 4,802,841 pairs; women's, misses', and children's, 12,704,993. There were 15,000,721 pairs of infants' shoes and slippers manufactured, and of all other goods of this nature there were 4,865,429 pairs.

The products of the essential-oil industry in 1909 had a total value of $1,737,234.

Gloves and Mittens—Leather.

The total value of the manufactures in the United States, in 1909, was $23,630,598. Of gloves, mittens, and gauntlets, there were manufactured 3,368,655 dozen pairs, valued at $22,525,861. Of these there were made for men 2,585,977 dozen pairs, valued at $17,060,797; this included 921,259 dozen pairs lined gloves and mittens, valued at $5,222,174; 1,664,718 dozen pairs unlined, valued at $11,838,623 For women and children there were manufactured 782,678 dozen pairs, valued at $5,465,064; this included 365,477 dozen pairs lined gloves and mittens, valued at $1,718,198 417,201 pairs unlined, valued at $3,746,866. The value of all other products of this industry was $1,104,737.

VIII. CHEMICALS AND ALLIED PRODUCTS.

The total value of chemicals and allied products in the United States in 1909 was $117,688,887. The value of the acids was $11,926,389; sodas were valued at $21,417,982; of potashes there were manufactured 1,866,570 pounds, valued at $88,940; the value of the alums manufactured was $2,578,842; coal-tar products were valued at $2,675,327; the value of the cyanides was $1,941,893; bleaching materials were valued at $1,635,046; chemical substances produced by the aid of electricity, were valued at $17,968,277; 121,946,967 pounds of calcium carbide, were produced, valued at $2,984,001; 11,802,076 pounds of anhydrous ammonia, valued at $2,503,315; of carbon dioxide, 47,238,267 pounds were produced, valued at $2,317,808.

Dyestuffs and Extracts.

The total value of these products for the year 1909 was $15,954,574. The 12,267,399 pounds of artificial dyestuffs were valued at $3,462,436.

Explosives.

The total cost of the materials used in the manufacture of explosives was $22,811,548; 188,889 tons of nitrate of soda were used, valued at $7,892,336; 51,764,694 pounds of mixed acids costing $1,512,626, were needed; 7,591,756 pounds of nitric acid, costing $541,314; 22,501 tons of sulphuric acid, costing $406,204; 17,389 tons of sulphur or brimstone, costing $367,866. The cost of all other materials used was $12,091,202. The total value of the manufactured products was $40,139,661; the value of the 177,155,851 pounds of dynamite used was $18,699,746; 28,913,253 pounds of nitroglycerin, sold as such, $3,162,434; 9,339,087 twenty-five pound kegs of blasting powder, valued at $9,608,265; of permissible explosives 9,607,448 pounds valued at $863,209; 12,862,700 pounds of gunpowder, valued at $1,736,427; 7,464,825 pounds of other explosives, valued at $3,913,787. The value of all other products was $2,155,793.

Fertilizers.

The total cost of the materials used in the making of fertilizers in 1909 was $69,521,920. The total value of the products was $103,960,213. 5,240,164 pounds of fertilizers, valued at $92,369,631.

Salt.

The total value of the salt products of the United States in 1909 was $11,327,834. There were 29,933,060 barrels of salt, valued at $8,311,729; 728,875 pounds of bromine, valued at $92,735; the value of all other products was $2,923,370.

SALT, CLASSIFIED BY GRADE (BARRELS).

Table and dairy	3,042,824
Common, fine	7,745,204
Common, coarse	2,843,393
Packers	385,802
Coarse, solar	1,109,396
Rock salt, mined	5,938,721
Milling, other grades and brine	8,867,720

PROCESS EMPLOYED

Total number of establishments	124
Number reporting:	
Solar	46
Kettle	1
Grainer	50
Open pan	11
Vacuum pan	21

See also Chapter on "Mines and Quarries."

Paint and Varnish.

In the manufacture of these products the following materials were used,—145,917 tons (2,000 pounds) of pig lead, costing $12,014,859; 1,683,382 gallons alcohol, costing $920,086, 1,327,157 gallons of which was wood alcohol, costing $693,362; 356,225 gallons grain alcohol, costing $226,724.

The total value of these products in 1909 was $124,889,422. The value of the pigments was $16,985,588; 85,234,414 pounds of white lead, dry, was valued at $3,921,803. The value of paints in oil was $56,763,296; 246,567,570 pounds white lead in oil, were valued at $15,234,411. The value of varnishes and japans was $31,262,535. The value of fillers, all kinds included, was $3,126,271; of these 1,159,569 gallons of liquid fillers were valued at $823,063.

Turpentine and Rosin.

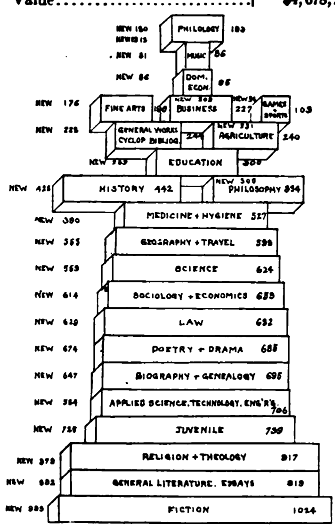
The total value of the turpentine and rosin industry for 1909 was $25,295,017; the 28,988,954 gallons of turpentine were valued at $12,654,228; the 3,263,857 barrels (280 pounds each), of rosin, were valued at $12,576,721.

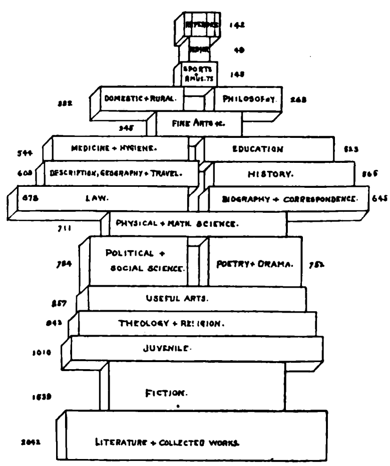
COALING STATIONS OF EUROPE AND AFRICA.

IX. ELECTRICAL INDUSTRY.

PRODUCT.	1909
Total value	[1] $243,965,093
Dynamos:	
Number	16,791
Kilowatt capacity	1,405,950
Value	$13,081,048
Dynamotors, motor generators, boosters, rotary converters, and double current generators	$3,154,733
Transformers	$8,801,019
Switchboards, panel boards, and cut-out cabinets	$5,971,804
Motors:	
Total number	504,030
Horsepower	2,733,418
Value	$32,087,482
For power—	
Number	243,423
Horsepower	1,683,677
Value	$18,306,451
For automobiles—	
Number	2,796
Horsepower	12,471
Value	$294,152
For fans—	
Number	199,113
Horsepower	178,033
Value	$2,450,739
For elevators—	
Number	4,988
Horsepower	63,585
Value	$1,188,653
For railways, and miscellaneous services, including value of parts and supplies—	
Number	53,710
Horsepower	795,652
Value	$9,847,487
Storage batteries, including value of parts and supplies:	
Weight of plates in pounds	23,119,331
Value	$4,678,209

PRODUCT.	1909
Primary batteries, including value of parts and supplies:	
Number	34,333,531
Value	$5,934,261
Arc lamps:	
Number	123,985
Value	$1,706,959
Searchlights, projectors, and focusing lamps	$935,874
Incandescent lamps	$15,714,809
Carbon filament	$6,157,066
Tungsten	$6,241,133
Gem, tantalum, glower, and vacuum and vapor lamps	$2,715,991
Decorative and miniature lamps, X-ray bulbs, vacuum tubes, etc	$600,619
Sockets, receptacles, bases, etc	$4,521,729
Electric-lighting fixtures of all kinds	$6,128,282
Telegraph apparatus	$1,957,432
Telephone apparatus	$14,259,357
Insulated wires and cables	$51,624,737
Electric conduits	$5,098,264
Annunciators—domestic, hotel, and office	$235,567
Electric clocks and time mechanisms	$352,513
Fuses	$1,001,719
Lightning arresters	$940,171
Rheostats and resistances	$2,674,963
Heating, cooking, and welding apparatus	$1,003,038
Electric flatirons	$951,074
Electric measuring instruments	$7,800,010
Electrical therapeutic apparatus	$1,107,858
Magneto-ignition apparatus, sparks, coils, etc	$6,092,343
Electric switches, signals, and attachments	$5,377,843
Circuit fittings of all kinds	$1,080,287
All other products, value	$39,691,708





Charts Prepared by F. E. Woodward, Washington, D. C.

ANALYSIS OF BOOKS PUBLISHED IN THE UNITED STATES, 1910-1911.

X. PAPER AND PULP.

	1909
MATERIALS.	
Total cost	$165,442,341
Pulp wood, cost	$33,772,475
Wood pulp, purchased:	
Tons	1,241,914
Cost	$43,861,357
Ground—	
Tons	452,849
Cost	$9,487,508
Soda fiber—	
Tons	154,626
Cost	$6,862,864
Sulphite fiber—	
Tons	626,029
Cost	$27,184,726
Other chemical fiber—	
Tons	8,410
Cost	$326,259
Rags, including cotton, flax waste and sweepings:	
Tons	357,470
Cost	$10,721,559
Old and waste paper:	
Tons	933,882
Cost	$13,691,120
Manila stock, including jute bagging, rope, waste, threads, etc.:	
Tons	117,060
Cost	$3,560,033
Straw:	
Tons	303,137
Cost	$1,460,282
All other materials, cost	$58,375,515
PRODUCTS.	
Total value	[1] $267,656,964
News paper:	
In rolls for printing—	
Tons	1,091,017
Value	$42,807,064
In sheets for printing—	
Tons	84,537
Value	$4,048,496
Book paper:	
Book—	
Tons	575,616
Value	$42,846,674
Coated—	
Tons	96,213
Value	$9,413,961
Plate, lithograph, map, woodcut, etc.—	
Tons	6,498
Value	$555,352
Cover—	
Tons	17,578
Value	$1,982,853
Cardboard, bristol board, card middles, tickets, etc.—	
Tons	51,449
Value	$3,352,151
Fine paper:	
Writing—	
Tons	169,125
Value	$24,966,102
All other—	
Tons	29,068
Value	$4,110,536
Wrapping paper:	
Manila (rope, jute, tag, etc.)—	
Tons	78,731
Value	$6,969,436
Heavy (mill wrappers, etc.)—	
Tons	108,561
Value	$4,380,794
Straw—	
Tons	32,968
Value	$870,419
PRODUCTS—continued.	
Wrapping paper—Continued.	
Bogus or wood manila, all grades—	
Tons	367,932
Value	$19,777,707
All other—	
Tons	179,855
Value	$10,202,036
Boards:	
Wood pulp—	
Tons	71,036
Value	$2,639,496
Straw—	
Tons	171,789
Value	$3,750,851
News—	
Tons	74,606
Value	$2,215,469
All other—	
Tons	514,208
Value	$17,539,768
Other paper products:	
Tissues—	
Tons	77,745
Value	$8,553,654
Blotting—	
Tons	9,577
Value	$1,186,180
Building roofing, asbestos, and sheathing—	
Tons	225,824
Value	$9,251,368
Hanging—	
Tons	92,158
Value	$4,431,514
Miscellaneous—	
Tons	96,577
Value	$6,869,169
Wood pulp made for sale or for consumption in mills other than where produced:	
Ground—	
Tons	310,747
Value	$5,649,466
Soda fiber—	
Tons	155,844
Value	$6,572,152
Sulphite fiber—	
Tons	444,255
Value	$17,955,748
All other products, value	$4,738,549
Wood pulp.	
Quantity produced (including that used in mills where manufactured), total tons	2,495,523
Ground, tons	1,179,266
Soda fiber, tons	298,626
Sulphite fiber, tons	1,017,631
EQUIPMENT.	
Paper machines:	
Total number	1,480
Capacity, yearly, tons	5,293,397
Fourdrinier—	
Number	804
Capacity per 24 hours, tons	10,508
Cylinder—	
Number	676
Capacity per 24 hours, tons	6,316
Pulp:	
Grinders, number	1,435
Digesters, total number	542
Sulphite fiber, number	348
Soda fiber, number	194
Capacity, yearly, tons of pulp	3,405,621
Ground, tons	1,809,685
Sulphite, tons	1,250,983
Soda, tons	344,953

THE CIVILIZED WORLD'S CONSUMPTION OF PAPER PRESENTED IN GRAPHICAL FORM.

PUBLICATIONS.

PRODUCT.	1909
Total value	**$737,876,087**
Publications:	
Newspapers and periodicals	$337,596,288
Subscriptions and sales	$135,063,043
Advertising	$202,533,245
Newspapers	$232,993,094
Subscriptions and sales	$84,438,702
Advertising	$148,554,392
Periodicals	$104,603,194
Subscriptions and sales	$50,624,341
Advertising	$53,978,853
Ready prints, patent insides and outsides	$2,293,077
Books and pamphlets—	
Published, or printed and published	$62,930,394
Printed for publication by others	$10,209,509
Sheet music and books of music—	
Published or printed and published	$5,510,698
Printed for publication by others	$1,000,966
Products for sale and in execution of orders:	
Job printing	$207,940,227
Book binding and blank books	$50,552,808
Electrotyping, engraving, and lithographing	$47,956,979
All other products	$11,885,141
NEWSPAPERS AND PERIODICALS.	
Number	**22,141**
Aggregate circulation	**164,463,040**
By period of issue:	
Daily (exclusive of Sunday)—	
Number	2,600
Aggregate circulation	24,211,977
Sunday—	
Number	520
Aggregate circulation	13,347,282
Semiweekly and triweekly—	
Number	708
Aggregate circulation	2,648,308
Weekly—	
Number	15,097
Aggregate circulation	40,822,965
Monthly—	
Number	2,491
Aggregate circulation	63,280,535
All other—	
Number	725
Aggregate circulation	20,151,973
By character:	
News, politics, and family reading—	
Number	17,698
Aggregate circulation	61,074,990
Religious—	
Number	1,251
Aggregate circulation	29,523,777
Agricultural, horticultural, dairy, stock raising, etc.—	
Number	316
Aggregate circulation	11,327,253

PRODUCT.	1909
NEWSPAPERS AND PERIODICALS—Continued.	
By character—Continued.	
Commerce, finance, insurance, railroads, etc.—	
Number	264
Aggregate circulation	1,411,738
Trade journals generally—	
Number	685
Aggregate circulation	3,572,441
General literature, including monthly and quarterly magazines—	
Number	340
Aggregate circulation	31,322,035
Medicine and surgery—	
Number	197
Aggregate circulation	931,584
Law—	
Number	56
Aggregate circulation	151,346
Science and mechanics—	
Number	139
Aggregate circulation	1,421,955
Fraternal orgainizations—	
Number	419
Aggregate circulation	6,982,235
Education and history—	
Number	202
Aggregate circulation	1,879,383
Society, art, music, fashions, etc.—	
Number	164
Aggregate circulation	13,445,661
College and school periodicals—	
Number	271
Aggregate circulation	330,705
Miscellaneous—	
Number	139
Aggregate circulation	1,087,937
By language:	
English—	
Number	20,744
Aggregate circulation	155,432,243
Foreign (including foreign and English)—	
Number	1,397
Aggregate circulation	9,030,797
French—	
Number	39
Aggregate circulation	446,739
German—	
Number	692
Aggregate circulation	4,434,146
Italian—	
Number	104
Aggregate circulation	500,475
Scandinavian—	
Number	161
Aggregate circulation	1,118,601
Slavonic—	
Number	169
Aggregate circulation	917,649
All other—	
Number	232
Aggregate circulation	1,613,187

The earliest advertisement in England was found in "Perfect Occurrences of Every Daie" 1647.

PUBLICATIONS BY STATES.

Showing the number of newspapers and periodicals of all issues published in the United States, Territories, and Dominion of Canada; the number of towns in which newspapers are published, and the number of towns which are county seats.

States, Territories and Canadian Provinces.	*No. of Towns in which Papers are published.*	*No. of Towns which are County Seats.*	*Issues.* *Daily.*	*Tri-Weekly.*	*Semi-Weekly.*	*Weekly.*	*Fortnightly.*	*Semi-Monthly.*	*Monthly.*	*Bi-Monthly.*	*Quarterly.*	*Miscellaneous.*	*Total—all Issues.*
NEW ENGLAND STATES.													
Connecticut	67	9	36		8	95	2	1	13		3		158
Maine	73	16	13	1	4	94		1	19		3		135
Massachusetts	206	20	85	3	7	391	2	12	127	6	28		661
New Hampshire	65	12	18	2	2	82			11	1			114
Rhode Island	18	4	14		3	26		1	11	1			56
Vermont	67	12	9			82		1	8			1	101
	496	73	173	6	24	770	4	16	189	8	34	1	1225
NEW YORK.													
New York	504	61	207	7	46	1031	10	42	591	15	40	5	1994
MIDDLE ATLANTIC STATES.													
Delaware	14	3	3			28		1	5				37
District of Columbia			7			22			41	3	6		79
Maryland	60	28	17	1	2	112	1	2	20	2	6		163
New Jersey	162	21	50		4	275		4	32	1	3		369
Pennsylvania	454	67	215	6	42	839	5	12	236	6	36	2	1399
	690	114	292	7	48	1276	6	19	334	12	51	2	2047
SOUTHERN STATES.													
Alabama	136	69	27		6	191		6	16		2		248
Arkansas	167	85	32		9	255			15	1			312
Florida	100	46	21	1	3	137		1	9		1		173
Georgia	203	136	27	2	14	257	1	6	47	3	1		358
Kentucky	155	112	28	2	23	216		6	28	2		1	306
Louisiana	108	56	21	1	4	170	2	5	24				227
Mississippi	145	87	17		4	201	2	6	16				246
North Carolina	164	85	29		24	203	2	11	29		5	1	304
South Carolina	85	44	15		19	113		2	17				166
Tennessee	146	87	16		7	222		3	35		15		298
Texas	613	224	100		27	816		7	69		2		1021
Virginia	136	65	34	2	6	173		4	33	2	8		262
West Virginia	93	55	30		4	174		1	13				222
	2251	1151	397	8	150	3128	7	58	351	8	34	2	4148
MIDDLE WESTERN STATES.													
Illinois	650	102	175	4	36	1056	6	30	452	8	10	2	1779
Indiana	352	91	152	1	23	525		6	60	1	6		774
Michigan	395	83	82	4	23	530	1	2	85	2	2		731
Ohio	417	88	173	5	44	720	7	13	171	6	23	1	1163
Wisconsin	349	71	65	1	16	538		3	53	1	2		679
	2163	435	647	15	142	3369	14	54	821	18	43	3	5126
WESTERN STATES.													
Colorado	193	59	47	1	7	323	1	2	34	1	1		417
Iowa	573	99	65	6	42	778		10	56	1	1		959
Kansas	457	105	70		13	632		1	29	1	1		747
Minnesota	440	85	39		4	637	2	11	48	4	2	1	748
Missouri	467	113	81		16	733	5	18	104	1	8		966
Montana	124	31	19		6	160		2	6				193
Nebraska	400	91	30	1	14	543	1	4	34	1			628
New Mexico	75	23	6	1	3	106			2	1			119
North Dakota	268	49	13			334			6				353
Oklahoma	391	76	48		2	567		5	23		1		646
South Dakota	312	58	20		4	408		1	12				445
Wyoming	52	18	5		5	66		1	3				80
	3752	807	443	9	116	5287	9	55	357	10	14	1	6301
PACIFIC SLOPE STATES.													
Arizona	34	14	15			46		1	3				65
California	340	65	163	2	36	540	1	8	106	4	2	1	863
Idaho	109	27	9		6	134			7		1		157
Nevada	30	15	11	3		31		1					46
Oregon	143	34	35		13	205	1	1	29		1		285
Utah	57	23	6	4	5	73		3	7				98
Washington	218	40	37		8	301	1	4	40	1		1	393
	931	218	276	9	68	1330	3	18	192	5	4	2	1907
OUTLYING TERRITORIES.													
Alaska	16		10			14							24
Hawaii	6		7	4	2	17			8				38
Philippines	6		13	1	2	4			8			1	29
Porto Rico	5	4	11			6		3	1				21
	33	4	41	5	4	41		3	17			1	112
CANADIAN PROVINCES.													
Alberta	82		10		3	99	2	2	2				118
British Columbia	53		18	2	8	72		1	12				113
Manitoba	68		9		1	104		3	26				143
Saskatchewan	132		10		2	153			2			1	168
Yukon	2		1			2							3
New Brunswick	18		8	1	10	24		2	8	1			54
Nova Scotia	37		14	2	4	44	2	2	7		1		76
Ontario	280	46	59	1	16	440	2	12	125	1	10		666
Prince Edward Island	3	2	4		1	9			1				15
Quebec	148	24	20	1	1	197	1		30		2		152
Newfoundland	6	3	4			9			4		1		18
	829	75	157	7	46	1053	7	22	217	2	14	1	1526

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INTERNATIONAL BOOK PRODUCTION.

TABLE OF BOOK PRODUCTION OF LEADING COUNTRIES—1901-1910.

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910
Germany........	25,331	26,906	27,606	28,378	28,886	28,703	30,073	30,317	31,051	31,281
France	13,053	12,199	12,264	12,139	12,416	10,898	10,785	11,073	13,185	12,615
Great Britain....	6,044	7,381	8,381	8,334	8,252	8,603	9,914	9,821	10,725	10,804
Italy	......	......	.....	....	......	6,822	7,040	6,918	6,833	6,788
Switzerland	1,766	1,655	2,452	2,739	3,316	3,249	3,085	4,256	4,390	4,290
Holland.........	2,837	2,917	3,005	3,403	3,290	3,346	3,408	3,258	3,652	3,777
Belgium...... ...	2,613	2,499	2,639	2,734	2,624	2,410	2,680	2,763	2,697	2,588
United States....	8,141	7,833	7,865	8,291	8,122	7,139	9,620	9,254	10,901	13,470

Publishers' Weekly.

RECORD OF AMERICAN BOOK PRODUCTION FOR 1912

International Classification	For 1912: New Publications: New Books	New Editions	By Origin: *American Authors*	*English and Other Foreign Authors*: *American Manuf.*	*Imported*	Total	For 1911: New Publications: New Books	New Editions	By Origin: *American Authors*	*English and Other Foreign Authors*: *American Manuf.*	*Imported*	Total
Philosophy.................	308	13	*233*	*13*	*75*	321	305	29	*244*	*18*	*72*	334
Religion and Theology......	865	51	*588*	*43*	*285*	916	879	38	*662*	*48*	*207*	917
Sociology and Economics ...	802	65	*764*	*17*	*86*	867	614	39	*559*	*21*	*73*	653
Law........................	783	79	*852*	*2*	*8*	862	629	53	*675*	*4*	*3*	682
Education..................	251	3	*217*	*2*	*35*	254	289	11	*269*	*8*	*23*	300
Philology..................	279	15	*115*	*84*	*95*	294	180	12	*89*	*60*	*43*	192
Science....................	631	64	*507*	*8*	*180*	695	559	65	*492*	*10*	*122*	624
Applied Science, Technology, Engineering..............	594	80	*548*	*6*	*120*	674	584	122	*575*	*7*	*124*	706
Medicine, Hygiene..........	388	107	*362*	*10*	*123*	495	390	137	*460*	*20*	*47*	527
Agriculture	292	13	*275*	*2*	*28*	305	231	9	*219*		*21*	240
Domestic Economy..........	83	27	*101*	*2*	*7*	110	81	14	*86*	*2*	*7*	95
Business........	189	21	*176*	*1*	*33*	210	209	18	*206*	*3*	*18*	227
Fine Arts..................	217	26	*135*	*3*	*105*	243	176	20	*105*	*7*	*84*	196
Music......................	89	4	*57*	*3*	*33*	93	81	5	*62*	*4*	*20*	86
Games, Sports, Amusements..	126	6	*106*	*1*	*25*	132	94	9	*80*	*2*	*21*	103
General Literature, Essays...	498	26	*337*	*35*	*152*	524	892	27	*523*	*170*	*226*	919
Poetry and Drama.	620	16	*377*	*97*	*162*	636	674	11	*385*	*148*	*152*	685
Fiction....................	960	50	*712*	*110*	*188*	1010	999	25	*701*	*121*	*202*	1024
Juvenile Publications.........	533	13	*428*	*27*	*91*	546	725	9	*439*	*36*	*259*	734
History....................	492	32	*373*	*4*	*147*	524	425	17	*326*	*15*	*101*	442
Geography and Travel.......	476	28	*307*	*7*	*190*	504	555	43	*381*	*25*	*192*	598
Biography, Genealogy.......	554	27	*331*	*23*	*227*	581	647	48	*433*	*36*	*226*	695
General Cyclopædias, General Works, Bibliographies, Miscellaneous................	105	2	*74*	*4*	*29*	107	222	22	*212*	*6*	*26*	244
Total....................	10,135	768	*7975*	*504*	*2424*	10,903	10,440	783	*8183*	*771*	*2269*	11,123

Publishers' Weekly.

STATISTICS RELATIVE TO NEWSPAPERS IN THE UNITED STATES

	New England States		New York		Middle Atlantic States		Southern States		Middle Western States		Western States		Pacific Slope States		Outlying Territories		Total for United States and Territories		Canada and Newfoundland		Total		Increase or Decrease
TOWNS AND COUNTY SEATS.	1912	1913	1912	1913	1912	1912	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1913	1912	1912	1912	1912	1913	1913
No. of Towns in which Papers are published	492	496	500	504	687	690	2219	2251	2189	2168	3889	3762	880	881	82	83	10706	10800	705	829	11412	11629	[illegible]
No. of Towns which are County Seats	72	73	62	61	114	114	1152	1151	434	435	806	807	226	228	4	4	2847	2863	103	75	2948	2938	[illegible]
NEWSPAPERS.																							
Daily	167	178	204	207	291	292	895	897	648	647	441	443	272	276	41	41	2439	2476	151	157	2610	2633	[illegible]
Tri-Weekly	5	8	4	7	8	7	8	8	19	15	9	9	12	9	5	5	70	66	5	7	75	73	[illegible]
Semi-Weekly	22	24	44	46	50	46	158	150	157	142	110	116	60	66	4	4	605	598	45	46	650	644	[illegible]
Weekly	780	770	1065	1061	1296	1276	3175	3128	8390	[illegible]	5629	5287	1277	1330	39	41	16229	16263	1022	1058	17256	17285	[illegible]
Fortnightly	5	4	8	10	7	6	8	7	10	14	8	9	4	3			50	58	9	7	59	60	[illegible]
Semi-Monthly	18	16	39	42	21	19	70	56	52	54	50	55	18	18	8	8	266	265	21	22	287	287	
Monthly	198	180	604	601	235	231	385	361	790	831	369	357	186	193	26	17	2846	2852	229	217	3075	3069	[illegible]
Bi-Monthly	10	8	13	15	14	12	7	8	17	18	8	10	5	5			74	78	3	2	77	78	[illegible]
Quarterly	39	34	84	40	68	51	34	34	45	42	14	14	2	4			280	230	15	14	295	224	[illegible]
Miscellaneous	3	1	4	6	3	2	2	2	8	3	1	1	1	2	1	1	18	17	1	1	19	18	[illegible]
Total of all Issues	1212	1225	2080	1994	2077	2047	4192	4143	5121	5128	6949	6901	1857	1907	119	112	22457	22366	1808	1826	24345	24221	[illegible]

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*Decrease. †Net Increase.

Book Production of Leading Countries, 1910, by Classes.

	Germany	Great Britain	France	United States
Fiction	......	2833	1152	1797
Law	......	248	386	678
Religion	2510	1064	888	943
Education	4852	659	1160	523
Essays, Miscellany	4815	272	142	2042
Juvenile Publications	......	....		1010
Sociology	3125	816	1413	784
Poetry and Drama	....	590	1028	752
Science	1750		417	711
History	1254 (History and Biography)	860	1718	565
Biography				645
Medicine	1981	398	1230	544
Description and Travel	1480	604	394	599
Fine Arts	2089	1254 (Fine Arts and Applied Science)	328	365
Applied Science	2082		....	857
Philosophy	668	....	168	265
Household Science	1030 (Household Science and Agriculture)	...	19	332 (Household Science and Agriculture)
Agriculture			282	
Sports, Games	......	....	77	145
Wit and Humor	..	....	....	49
Philology	1884	....		...
Military Science	667		464	.
General Works	1094	1206		142

Printing was originally practiced by the Chinese in very early times; the origin of the present system seems to be very doubtful. The first metal plate from which impressions on paper were taken seems to have been executed in 1452. It was a pax or metal plate used in the Roman Catholic service. Early books containing engravings reproduced from metal plates are the "Kalendar" dated 1465, and the "Monte Santo de Dio," 1477. The first engraver proper who seems to have done nothing but engrave was Antonio Raimondi (1488-1530).

The first steam turbine was built in 1894 by the Hon. C. A. Parsons of Newcastle-on-Tyne; the first Atlantic passage turbine steamer was launched in 1904.

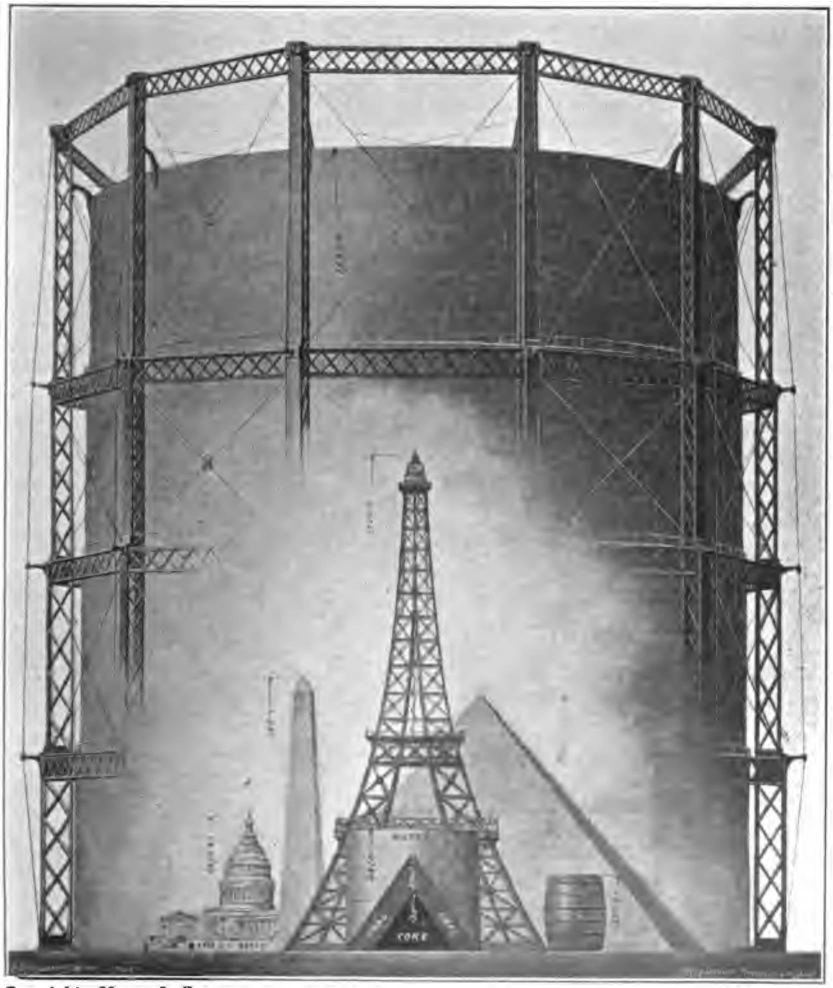
Book Production of Leading Countries.

Country.	Year.	Books.	Year.	Periodic'ls.
Algeria	—	—	1908	282
Argentine Republic	—	—	1900	739
Australia	—	—	1903	1,000
Austria	1901	2,050	1910	3,952
Belgium	1910	2,588	1910	1,655
Brazil	—	—	1902	300
Bulgaria	—	—	1897	90
Canada	1893	450	1910	1,429
Cape of Good Hope	—	—	1900	90
Ceylon	1909	422	—	—
Chili	1891	400	1896	312
China	—	—	1907	123
Costa-Rica	—	—	1903	18
Denmark	1910	3,305	1910	1,415
Egypt	1898	160	1902	120
Finland	—	—	1909	366
France	1910	11,266	1908	8,658
Germany	1910	31,281	1910	10,017
Great Britain	1910	10,804	1907	4,329
Greece	—	—	1895	130
Haiti	—	—	1903	27
Hawaii	—	—	1908	45
Holland	1910	3,777	1908	1,492
Hungary	1898	1,600	1904	1,644
Iceland	1903	212	1903	40
India	1895	8,000	1899	1,000
Ireland	1902	180	1902	30
Italy	1910	6,788	1907	3,068
Japan	1909	34,730	1909	2,727
Luxemburg	1910	97	1908	53
Mexico	—	—	1892	300
Norway	1904	682	1903	497
Paraguay	—	—	1908	21
Persia	—	—	1892	10
Portugal	—	—	1894	22
Roumania	1901	1,740	1903	330
Russia	1910	29,057	1910	2,391
Servia	—	—	1897	80
Spain	1902	1,400	1900	1,350
Sweden	1904	1,474	1906	804
Switzerland	1910	4,290	1909	1,332
Turkey	1890	900	1909	380
United States	1910	13,470	1910	22,806
Uruguay	1906	110	1906	240
Venezuela	—	—	1908	237

XI. MINOR INDUSTRIES.

Gas, Illuminating and Heating.

The total cost of the materials used in the manufacture of this product in the year 1909 was $52,427,844; 4,940,598 tons of coal cost $16,304,832; 579,657,152 gallons of oil cost $17,345,750; 591,919 tons coke, costing $2,667,706; all other materials cost $16,109,556. The total value of these products in 1909 was $166,814,371: 150,835,793 cubic feet (thousands) of gas were produced, having a value of $138,615,309; 19,985,253 cubic feet (thousands) straight coal, valued at $18,065,841; 25,186 cubic feet (thousands) of acetylene, valued at $361,348; 82,049,683 bushels of coke were produced, valued at $5,723,215; 92,152,938 gallons of tar, valued at $1,875,549; the value of all other products was $13,556,908.



THE MAGNITUDE OF THE GAS INDUSTRY.

A Week's Supply of Gas. Fuel for 23 Million Horse-Power Hours. The Gas Holder contains 2,163,207,368 Cubic Feet.

Laundries in 1909.

Number of establishments......	5,186
Capital invested............	$68,935,000
Cost of materials used........	17,696,000
Salaries and wages, total.....	53,007,747
Salaries..................	8,180,769
Wages....................	44,826,978
Miscellaneous expenses......	14,483,497
Value of products, or amount received for work done..	$104,680,086

Pianos and Organs and Materials.

In 1909, the total value of the pianos and organs, and materials, in establishments especially designed for their manufacture throughout the United States, amounted to $89,789,544. The whole number of pianos manufactured was 374,154, valued at $59,501,225: Of these there were 365,413 upright pianos, valued at $55,462,556; 330,918 pianos without player attachment, valued at $46,187,555; 34,495 pianos for or with player attachment, valued at $9,275,001; 8,741 grand pianos, valued at $4,038,669. There were 10,898 player attachments made separate from pianos, valued at $1,474,630. The whole number of organs made was 65,335, valued at $5,309,016: Of these there were 1,224 pipe organs, valued at $2,713,587; 64,111 reed organs, valued at $2,595,429. The value of other parts and materials manufactured, was $20,417,762; the value of all other products was $3,086,911.

Phonographs and Graphophones.

The total value of the phonographs, graphophones, and records manufactured in 1909, throughout the United States, was $11,725,996. There were 344,681 phonographs and graphophones made, valued at $5,406,684; 27,183,959 records and blanks, valued at $5,007,104; all other products were valued at $1,312,208. Since 1909 the products have vastly increased in quantity and value.

TABLE OF HEIGHT AND WEIGHT AT VARYING AGES.

Based upon an Analysis of 74,162 accepted Male Applicants for Life Insurance, as reported to The Association of Life Insurance Medical Directors, 1897.

Ages,	15—24	25—29	30—34	35—39	40—44	45—49	50—54	55—59	60—64	65—69
5 feet 0 inches	96 120 144	100 125 150	102 128 154	105 131 157	106 133 160	107 134 161	107 134 161	107 134 161	105 131 157	
1	98 122 146	101 126 151	103 129 155	105 131 157	107 134 161	109 136 163	109 136 163	109 136 163	107 134 161	
2	99 124 149	102 128 154	105 131 157	106 133 160	109 136 163	110 138 166	110 138 166	110 138 166	110 137 164	
3	102 127 152	105 131 157	107 134 161	109 136 163	111 139 167	113 141 169	113 141 169	113 141 169	112 140 168	112 140 168
4	105 131 157	108 135 162	110 138 166	112 140 168	114 143 172	115 144 173	116 145 174	116 145 174	115 144 173	114 143 172
5	107 134 161	110 138 166	113 141 169	114 143 172	117 146 175	118 147 176	119 149 179	119 149 179	118 148 178	118 147 176
6	110 138 166	114 142 170	116 145 174	118 147 176	120 150 180	121 151 181	122 153 184	122 153 184	122 153 184	121 151 181
7	114 142 170	118 147 176	120 150 180	122 152 182	124 155 186	125 156 187	126 158 190	126 158 190	126 158 190	125 156 187
8	117 146 175	121 151 181	123 154 185	126 157 188	128 160 192	129 161 193	130 163 196	130 163 196	130 163 196	130 162 194
9	120 150 180	124 155 186	127 159 191	130 162 194	132 165 198	133 166 199	134 167 200	134 168 202	134 168 202	134 168 202
10	123 154 185	127 159 191	131 164 197	134 167 200	136 170 204	137 171 205	138 172 206	138 173 208	139 174 209	139 174 209
11	127 159 191	131 164 197	135 169 203	138 173 208	140 175 210	142 177 212	142 177 212	142 178 214	144 180 216	144 180 216
6 0	132 165 198	136 170 204	140 175 210	143 179 215	144 180 216	146 183 220	146 182 218	146 183 220	148 185 222	148 185 222
1	136 170 204	142 177 212	145 181 217	148 185 222	149 186 223	151 189 227	150 188 226	151 189 227	151 189 227	151 189 227
2	141 176 211	147 184 221	150 188 226	154 192 230	155 194 233	157 196 235	155 194 233	155 194 233	154 192 230	154 192 230
3	145 181 219	152 190 228	156 195 234	160 200 240	162 203 244	163 204 245	161 201 241	158 198 238		

SUMMARY OF MANUFACTURES: BY SPECIFIED INDUSTRIES, 1909.

Source: Reports of the Bureau of the Census, Department of Commerce and Labor. The figures for some industries do not represent the total value of the products, because important establishments that manufacture the same class of products may be included in other industries. [Primary horse-power includes power generated in manufacturing establishments plus electric and other power rented from outside sources; it does not include electric power generated by primary units of the establishments reporting.]

INDUSTRY.	Persons Engaged.	Primary Horse-Power.	Value of Products
Agricultural implements	60,229	100,601	$146,329,000
Artificial flowers and feathers and plumes	11,583	334	23,981,000
Artificial stone	15,202	12,185	18,596,000
Artists' materials	865	1,628	2,340,000
Automobiles, including bodies and parts	85,359	75,550	249,202,000
Awnings, tents and sails	5,747	2,022	14,499,000
Axle grease	334	492	1,481,000
Babbitt metal and solder	1,491	2,293	19,768,000
Bags, other than paper	8,838	6,855	54,882,000
Bags, paper	3,683	3,885	15,698,000
Baking powders and yeast	3,531	3,335	20,775,000
Baskets, and rattan and willow ware	5,419	7,196	5,695,000
Beet sugar	8,389	57,202	48,122,000
Belting and hose, leather	4,370	5,438	23,692,000
Belting and hose, woven and rubber	7,304	6,319	24,729,000
Bicycles, motor cycles and parts	5,017	5,932	10,699,000
Billiard tables and materials	1,776	2,642	5,878,000
Blacking and cleansing and polishing preparations	4,407	3,977	14,679,000
Bluing	545	242	1,074,000
Bone, carbon and lampblack	302	1,023	1,093,000
Boots and shoes, including cut stock and findings	215,923	96,302	180,060,000
Boots and shoes, rubber	18,899	25,903	49,721,000
Boxes, cigar	6,852	6,049	8,491,000
Boxes, fancy and paper	43,568	23,323	54,450,000
Brass and bronze products	45,441	106,120	149,989,000
Bread and other bakery products	144,322	65,298	396,865,000
Brick and tile	85,764	341,169	92,776,000
Brooms and brushes	15,143	8,800	29,126,000
Butter, cheese and condensed milk	31,506	101,349	274,558,000
Butter, reworking	418	1,471	8,200,000
Buttons	18,004	12,831	22,708,000
Calcium lights	26	53	52,000
Candles	649	799	3,130,000
Canning and preserving	71,972	81,179	157,101,000
Card cutting and designing	702	269	1,031,000
Carpets and rugs, other than rag	34,706	38,553	71, 188,000
Carpets, rag	2,688	2,651	2,568,000
Carriages and sleds, children's	5,769	5,281	8,805,000
Carriages and wagons and materials	82,944	126,032	159,893,000
Cars and general shop construction and repairs by steam-railroad companies	301,273	293,361	405,601,000
Cars and general shop construction and repairs by street-railroad companies	23,699	35,794	31,963,000
Cars, steam-railroad, not including operations of railroad companies	47,094	97,797	123,730,000
Cars, street-railroad, not including operations of railroad companies	4,005	15,161	7,810,000
Cash registers and calculating machines	9,249	6,944	23,708,000
Cement	29,551	371,799	63,205,000
Charcoal	731	165	872,000
Chemicals	27,791	208,604	117,689,000
China decorating	436	18	786,000
Chocolate and cocoa products	3,404	10,593	22,390, 000
Clocks and watches, including cases and materials	25,439	14,957	35,197,000
Cloth, sponging and refinishing	1,167	704	1,544,000
Clothing, horse	1,830	1,454	4,135,000
Clothing, men's, including shirts	271,437	42,725	568,077,000
Clothing, men's, buttonholes	1,031	176	781,000
Clothing, women's	179,021	22,294	384,752,000
Coffee and spice, roasting and grinding	13,516	22,234	110,533,000
Coffins, burial cases, and undertakers' goods	11,448	16,490	24,526,000
Coke	31,226	62,602	95,697,000
Confectionery	54,854	35,870	134,796,000

SUMMARY OF MANUFACTURES: BY SPECIFIED INDUSTRIES, 1909. — Continued

INDUSTRY.	Persons Engaged.	Primary Horse-Power.	Value of Products.
Cooperage and wooden goods, not elsewhere specified	29,717	65,108	60,248,000
Copper, tin and sheet-iron products	86,934	62,366	199,824,000
Cordage and twine, jute and linen goods	27,214	78,549	61,020,000
Cordials and syrups	1,638	1,154	9,662,000
Cork, cutting	3,376	3,746	5,940,000
Corsets	19,611	4,581	33,257,000
Cotton goods, including cotton small wares	387,771	1,296,517	628,392,000
Crucibles	398	816	1,849,000
Cutlery and tools, not elsewhere specified	37,161	68,294	53,266,000
Dairymen's, poulterers', and apiarists' supplies	6,431	6,898	15,463,000
Dentists' materials	1,982	865	10,836,000
Drug grinding	1,152	3,322	6,007,000
Dyeing and finishing textiles	47,303	107,746	83,556,000
Dyestuffs and extracts	3,015	22,213	15,955,000
Electrical machinery, apparatus and supplies	105,600	158,768	221,309,000
Electroplating	3,558	4,461	4,510,009
Emery and other abrasive wheels	2,446	4,005	6,711,000
Enameling and japanning	2,418	1,695	3,316,000
Engravers' materials	189	549	921,000
Engraving and dyesinking	1,782	768	2,250,000
Engraving, wood	480	39	711,000
Explosives	7,058	28,601	40,140,000
Fancy articles, not elsewhere specified	14,194	8,310	22,632,000
Fertilizers	21,950	64,711	103,960,000
Files	4,521	7,383	5,691,000
Firearms and ammunition	16,042	17,840	34,112,000
Fire extinguishers, chemical	300	215	754,000
Fireworks	1,567	517	2,269,000
Flags, banners, regalia, society badges and emblems	4,522	1,173	8,114,000
Flavoring extracts	2,634	1,060	8,828,000
Flax and hemp, dressed	216	1,147	467,000
Four-mill and gristmill products	66,054	853,584	883,584,000
Food preparations	20,965	55,166	125,331,000
Foundry and machine-shop products	615,485	869,305	1,228,475,000
Foundry supplies	710	4,995	2,298,000
Fuel, manufactured	112	1,290	311,000
Fur goods	16,152	2,120	55,938,000
Furnishing goods, men's	43,935	12,116	87,710,000
Furniture and refrigerators	144,140	221,451	239,886,000
Furs, dressed	1,472	2,103	2,391,000
Galvanizing	1,689	1,367	7,338,000
Gas and electric fixtures and lamps and reflectors	22,906	15,862	45,057,000
Gas, illuminating and heating	51,007	128,350	166,814,000
Glass	72,573	128,532	92,095,000
Glass, cutting, staining, and ornamenting	11,090	4,897	16,101,000
Gloves and mittens, leather	12,950	2,889	23,631,000
Glucose and starch	5,827	28,257	48,799,000
Glue	3,840	15,596	13,718,000
Gold and silver, leaf and foil	1,553	259	2,630,000
Gold and silver, reducing and refining, not from the ore	690	1,735	23,612,000
Graphite and graphite refining	262	1,472	1,140,000
Grease and tallow	5,504	14,613	23,419,000
Grindstones	1,485	5,700	1,688,000
Haircloth	621	995	2,230,000
Hairwork	4,383	218	5,135,000
Hammocks	325	157	578,000
Hand stamps and stencils and brands	2,539	903	3,673,000
Hat and cap materials	2,618	2,922	8,236,000
Hats and caps, other than felt, straw, and wool	7,609	990	13,689,000
Hats, fur felt	27,091	19,245	47,865,000
Hats, straw	9,704	3,482	21,424,000
Hones and whetstones	173	677	268,000
Horseshoes, not made in steel works or rolling mills	360	1,045	1,015,000
Hosiery and knit goods	136,130	103,709	200,143,000
House-furnishing goods, not elsewhere specified	5,916	9,328	18,509,000
Ice, manufactured	21,107	317,789	42,953,000
Ink, printing	1,854	5,857	8,865,000
Ink, writing	824	169	2,505,000
Instruments, professional and scientific	6,175	4,856	10,504,000

SUMMARY OF MANUFACTURES: BY SPECIFIED INDUSTRIES, 1909.—Continued.

INDUSTRY.	Persons Engaged.	Primary Horse-Power.	Value of Products.
Iron and steel, blast furnaces	43,061	1,173,422	391,429,000
Iron and steel, steel works and rolling mills	260,762	2,100,978	985,723,000
Iron and steel, bolts, nuts, washers, and rivets, not made in steel works or rolling mills	12,395	22,113	24,485,000
Iron and steel, doors and shutters	1,816	1,997	3,006,000
Iron and steel forgings	9,193	27,803	20,293,000
Iron and steel, nails and spikes, cut and wrought, including wire nails, not made in steel works or rolling mills	3,239	7,723	8,192,000
Iron and steel pipe, wrought	7,309	20,656	30,886,000
Jewelry	36,992	11,204	80,350,000
Jewelry and instrument cases	2,441	527	3,116,000
Kaolin and ground earths	2,351	20,920	4,681,000
Labels and tags	2,880	1,589	4,670,000
Lapidary work	886	679	9,173,000
Lard, refined, not made in slaughtering and meat-packing establishments	515	723	10,326,000
Lasts	2,029	3,386	4,159,000
Lead, bar, pipe, and sheet	1,044	3,179	9,145,000
Leather goods	43,525	28,148	104,719,000
Leather, tanned, curried and finished	67,100	148,140	327,874,000
Lime	15,659	27,671	17,952,000
Liquors, distilled	8,328	46,120	204,699,000
Liquors, malt	66,725	347,726	374,730,000
Liquors, vinous	2,726	6,771	13,121,000
Locomotives, not made by railroad companies	16,945	35,102	31,582,000
Looking-glass and picture frames	7,470	5,330	13,475,000
Lumber and timber products	784,989	2,840,082	1,156,129,000
Malt	2,237	26,441	38,252,000
Marble and stone work	77,275	187,686	113,093,000
Matches	4,220	6,224	11,353,000
Mats and matting	1,040	1,433	2,432,000
Mattresses and spring beds	14,109	17,689	35,783,000
Millinery and lace goods	46,301	7,918	85,894,000
Mineral and soda waters	22,060	19,392	43,508,000
Mirrors	3,509	3,862	9,571,000
Models and patterns, not including paper patterns	5,450	5,486	8,868,000
Moving pictures	718	486	4,206,000
Mucilage and paste	901	2,335	4,918,000
Musical instruments and materials not specified	2,269	1,423	3,228,000
Musical instruments, pianos and organs, and materials	41,882	41,623	89,790,000
Needles, pins and hooks and eyes	4,978	4,542	6,694,000
Oakum	129	289	338,000
Oil, castor	70	385	905,000
Oil, cotton seed and cake	21,273	192,342	147,868,000
Oil, essential	408	1,218	1,737,000
Oil, linseed	1,753	13,211	36,739,000
Oil, not elsewhere specified	3,144	5,772	30,865,000
Oilcloth and linoleum	5,557	16,125	23,339,000
Oleomargarine	773	2,408	8,148,000
Optical goods	7,809	5,725	11,735,000
Paint and varnish	21,896	56,162	124,889,000
Paper and wood pulp	81,473	1,304,255	267,657,000
Paper goods, not elsewhere specified	22,385	27,067	55,171,000
Paper patterns	1,755	751	2,611,000
Patent medicines and compounds and druggists' preparations	41,101	25,659	141,942,000
Paving materials	1,731	5,757	6,229,000
Peanuts, grading, roasting, cleaning and shelling	2,177	2,827	9,737,000
Pencils, lead	4,513	3,448	7,379,000
Pens, fountain, stylographic and gold	1,820	569	4,739,000
Pens, steel	755	244	577,000
Petroleum, refining	16,640	90,268	236,998,000
Phonographs and graphophones	5,928	6,371	11,726,000
Photographic apparatus and materials	6,596	8,637	22,561,000
Photo-engraving	7,277	2,638	11,624,000
Pipes, tobacco	3,090	1,506	5,312,000
Pottery, terra-cotta and fire-clay products	61,022	110,017	76,119,000
Printing and publishing	388,466	297,763	737,876,000

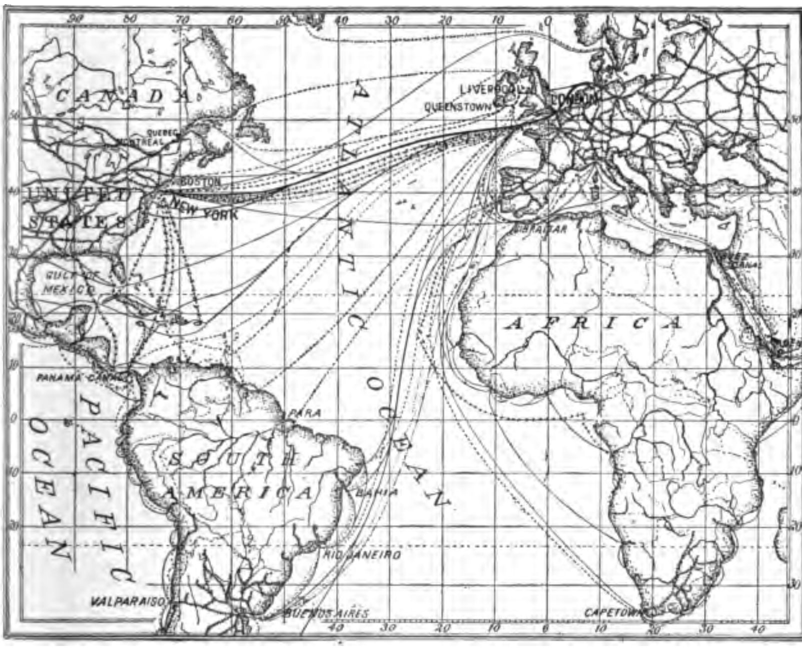
SUMMARY OF MANUFACTURES: BY SPECIFIED INDUSTRIES, 1909. — Continued.

INDUSTRY.	Persons Engaged.	Primary Horse-Power.	Value of Products.
Pulp goods	882	3,125	1,770,000
Pumps, not including steam pumps	2,623	4,214	5,583,000
Rice, cleaning and polishing	1,777	19,519	22,371,000
Roofing materials	3,530	9,431	19,204,000
Rubber goods, not elsewhere specified	31,284	79,062	128,436,000
Rules, ivory and wood	127	167	144,000
Safes and vaults	4,060	5,546	8,491,000
Salt	5,580	27,263	11,328 000
Sand and emery paper and cloth	779	3,351	4,358,000
Saws	5,757	11,852	11,536,000
Scales and balances	4,275	6,183	8,786,000
Screws, machine	1,863	3,319	3,014,000
Screws, wood	3,758	5,618	6,199,000
Sewing machines, cases and attachments	20,556	19,426	28,262,000
Shipbuilding, including boatbuilding	44,949	88,063	73,360,000
Shoddy	2,320	13,820	7,446,000
Show cases	3,943	4,746	7,167,000
Signs and advertising novelties	7,277	3,790	13,546,000
Silk and silk goods, including throwsters	105,238	97,947	196,912,000
Silverware and plated ware	18,774	15,183	42,229,000
Slaughtering and meat packing	108,716	208,707	1,370,568,000
Smelting and refining, copper	16,832	158,126	378,806,000
Smelting and refining, lead	8,059	26,954	167,406,000
Smelting and refining, zinc	7,156	21,457	34,206,000
Smelting and refining, not from the ore	2,596	10,705	28,072,000
Soap	18,393	28,360	111,358,000
Soda-water apparatus	2,399	2,894	6,556,000
Sporting and athletic goods	5,993	3,243	11,052,000
Springs, steel, car and carriage	3,573	7,349	9,005,000
Stationery goods, not elsewhere specified	7,938	6,842	16,647,000
Statuary and art goods	2,172	462	3,442,000
Steam packing	4,968	11,129	12,160,000
Stereotyping and electrotyping	3,661	4,076	6,384,000
Stoves and furnaces, including gas and oil stoves	42,921	45,524	78,853,000
Sugar and molasses, not including beet sugar	15,658	160,603	279,249,000
Sulphuric, nitric and mixed acids	2,582	6,494	9,884,000
Surgical appliances and artificial limbs	5,805	5,752	12,399,000
Tin plate and terneplate	5,846	8,154	47,970,000
Tin foil	762	1,699	3,419,000
Tobacco manufactures	197,637	28,514	416,695,000
Toys and games	6,072	5,323	8,264,000
Turpentine and resin	44,524	4,129	25,295,000
Type-founding and printing materials	2,597	1,948	4,703,000
Typewriters and supplies	12,101	6,845	19,719,000
Umbrellas and canes	6,505	2,413	15,864,000
Upholstering materials	4,777	17,456	13,054,000
Vault lights and ventilators	453	234	957,000
Vinegar and cider	3,073	16,681	8,448,000
Wall paper	4,746	5,680	14,449,000
Wall plaster	5,624	25,892	12,804,000
Washing machines and clothes wringers	2,294	3,351	5,825,000
Waste	2,129	4,286	11,398,000
Wheelbarrows	775	1,486	1,625,000
Whips	1,946	1,321	3,949,000
Windmills	2,742	3,301	6,677,000
Window shades and fixtures	4,770	5,737	18,571,000
Wire	19,945	71,959	84,486,000
Wirework, including wire rope and cable	14,994	20,131	41,938,000
Wood distillation, not including turpentine and resin	3,095	9,854	9,737,000
Wood carpet	221	269	490,000
Wood preserving	2,875	10,647	14,099,000
Wood, turned and carved	16,243	48,447	22,199,000
Wood pulling	759	1,366	5,181,000
Wool scouring	1,262	6,785	3,289,000
Woolen, worsted, and felt goods, and wool hats	175,176	362,209	435,979,000
All other industries*	132	136	390,000
Total	7,678,578	18,680,776	$20,672,052,000

* Includes the following industries: Millstones; ordnance and accessories; pulp, from fibre other than wood; straw goods, not elsewhere specified: and whalebone cutting.

CHAPTER V.

COMMERCE.



PRINCIPAL TRADE ROUTES ON THE ATLANTIC OCEAN.

AREA OF THE LARGEST LAKES.

	Square Miles.		Square Miles.
Caspian Sea (85 feet below the level of the Black Sea)	169,890	Lake Tsad (Afr.)	9,800
Lake Superior (N. Am.)	32,430	Lake Erie (N. Am.)	9,650
Victoria Nyanza (Afr.)	28,960	Lake Winnipeg (N. Am.)	9,270
Lake Aral (As.)	26,260	Great Slave Lake (N. Am.)	8,110
Lake Huron (N. Am.)	23,940	Great Bear Lake (N. Am.)	8,110
Lake Michigan (N. Am.)	23,940	Lake Balkash (As.)	8 110
Tanganyika (Afr.)	13,740	Lake Ontario (N. Am.)	7,720
Lake Baikal (As.)	13,130	Lake Ladoga (Russia)	6,950
Nyassa (Afr.)	10,230	Maracaibo Lake	6,490
		Great Salt Lake (N. Am.)	5,600

COMMERCIAL AND FINANCIAL STATISTICS OF THE PRINCIPAL COUNTRIES OF THE WORLD.

Country.	Area.	Population in 1911 or on latest available date.	Population per square mile.	Foreign commerce.[1]						
				Year.	Imports of merchandise.	Imports from United States.		Exports of merchandise.	Exports to United States.	
	Sq. miles.				*Dollars.*	*Dollars.*	*Per cent.*	*Dollars.*	*Dollars.*	*Per cent.*
Argentina	1,139,196	7,172,000	6.30	1911	353,972,000	50,521,000	14.3	313,333,000	23,450,000	7.5
Australasia:										
Commonwealth of Australia [2, 3, 4]	2,974,581	4,602,000	1.55	1911	325,897,000	37,706,000	11.6	370,853,000	7,003,000	1.9
New Zealand [2, 4]	104,751	1,063,000	10.15	1911	95,120,000	8,186,000	8.6	92,602,000	2,115,000	2.3
Austria-Hungary [5]	261,033	51,106,000	195.78	1911	647,917,000	58,821,000	9.1	488,074,000	11,866,000	2.4
Austria (including Bosnia and Herzegovina)	[6] 135,696	[6] 30,220,000	222.68	1911	....	....	....	....	....	....
Hungary	[6] 125,427	[6] 20,886,000	166.52	1911	....	....	....	....	....	....
Belgium [5]	11,373	7,490,000	658.58	1911	832,406,000	65,895,000	7.6	682,418,000	21,999,000	3.2
Kongo, Belgian [7]	913,127	20,000,000	21.90	1911	9,386,000	217,000	2.3	10,432,000	....	....
Bolivia [2]	708,195	2,268,000	3.20	1911	23,057,000	3,897,000	16.9	32,639,000	277,000	.8
Brazil [8]	3,291,416	21,115,000	6.23	1911	256,771,000	[9] 28,854,000	11.2	324,920,000	[9] 115,731,000	35.6
Bulgaria [5, 10]	37,199	4,329,000	116.37	1910	34,230,000	165,000	.5	24,907,000	216,000	.9
Canada [5]	3,729,665	7,205,000	1.93	[11] 1912	521,448,000	356,354,000	63.4	290,224,000	102,041,000	35.2
Central American States:										
Costa Rica	18,691	388,000	20.76	1911	8,838,000	4,093,000	46.3	8,890,000	4,902,000	55.1
Guatemala	48,290	2,031,000	42.06	1911	6,514,000	2,696,000	41.4	10,982,000	3,297,000	30.0
Honduras	46,250	566,000	12.23	[12] 1912	3,178,000	2,393,000	75.3	3,067,000	2,730,000	89.0
Nicaragua	49,532	600,000	12.11	1910	2,864,000	1,585,000	55.3	4,556,000	1,557,000	34.2
Panama [13]	32,380	387,000	11.95	1911	9,897,000	5,123,000	51.8	2,863,000	2,576,000	90.0
Salvador	8,170	1,707,000	208.94	1911	5,284,000	1,925,000	36.4	8,406,000	2,925,000	34.8
Chile [5]	292,420	3,415,000	11.68	1911	127,381,000	15,776,000	12.4	123,884,000	19,609,000	15.8
China [4]	4,277,170	336,042,000	78.57	1911	306,812,000	26,564,000	8.7	245,538,000	22,102,000	9.0
Colombia	435,278	5,032,000	11.56	1911	18,109,000	[9] 5,220,000	28.8	22,376,000	[9] 9,894,000	44.2
Cuba [14, 15]	45,881	2,220,000	48.39	[16] 1912	118,937,000	62,429,000	52.5	146,676,000	122,947,000	83.8
Denmark [14]	15,586	2,757,000	184.34	1911	180,074,000	17,002,000	9.0	143,821,000	866,000	.6
Ecuador	118,627	1,500,000	12.64	1910	8,018,000	2,253,000	28.1	13,657,000	4,087,000	29.9
Egypt [4, 15]	383,899	11,287,000	29.40	1911	134,584,000	1,590,000	1.2	141,365,000	10,238,000	7.2
Sudan [4, 15]	950,000	2,600,000	2.74	1911	11,240,000	11,000	.1	6,806,000	240,000	3.5
France [5]	207,129	39,602,000	191.19	1911	1,556,705,000	159,585,000	10.3	1,172,834,000	73,278,000	6.2
Algeria [5]	343,629	5,564,000	16.19	1911	110,296,000	1,068,000	1.0	98,353,000	534,000	.5
Tunis	64,633	1,929,000	29.85	1911	23,485,000	506,000	2.2	27,727,000	23,000	.1
French Indo-China [5]	256,255	16,990,000	66.30	1911	36,981,000	473,000	1.3	48,110,000	523,000	1.1
French colonies, n. e. s.[14]	3,334,196	25,150,000	7.54	1911	61,991,000	3,371,000	7.5	60,945,000	734,000	1.2
German Empire	[6] 208,794	[6] 64,926,000	310.96	1911	....	....	....	....	....	....

German Customs Union [5]	209,793	65,186,000	310.72	1911	2,309,756,000	319,755,000	13.8	1,928,419,000	152,251,000	7.9
German colonies [5, 17]	1,026,622	13,993,000	13.64	1910	30,879,000	271,000	.9	24,000,000	735,000	3.1
Greece [5, 18]	24,964	2,666,000	106.79	1910	30,984,000	813,000	2.6	27,902,000	2,034,000	7.3
Haiti	11,072	2,500,000	225.79	1911	7,948,000	[9] 6,656,000	83.7	18,554,000	[9] 813,000	4.4
India, British [4, 19]	1,773,088	314,955,000	177.63	[11] 1912	449,582,000	17,164,000	3.8	719,334,000	50,567,000	7.0
Italy [5]	110,688	34,687,000	313.38	1911	654,134,000	80,149,000	12.3	425,425,000	47,715,000	11.2
Eritrea (Massaua)	52,162	279,000	5.35	1910	3,160,000	[9] 2,000	.1	1,405,000	....	....
Japan (including Pescadores, but excluding Formosa and Sakhalin) [14]	147,699	51,547,000	342.90	1911	255,445,000	40,444,000	15.8	220,612,000	70,979,000	32.2
Formosa [20]	13,839	3,394,000	245.24	1911	26,540,000	863,000	3.3	32,213,000	2,991,000	9.3
Chosen (Korea) [14]	84,103	14,056,000	167.13	1911	26,936,000	2,122,000	7.9	9,391,000	475,000	5.1
Liberia	36,834	1,500,000	40.72	1909	1,043,000	[9] 75,000	7.2	955,000	[9] 284	....
Mexico [2, 21]	767,323	15,116,000	19.70	[16] 1912	90,965,000	49,011,000	53.9	148,411,000	111,608,000	75.2
Morocco	169,591	5,000,000	29.48	1911	18,196,000	139,000	.8	16,135,000	146,000	.9
Netherlands [5]	13,171	6,022,000	457.22	1911	930,874,000	132,897,000	14.3	1,090,848,000	42,247,000	3.9
Dutch East Indies [14, 22]	778,154	37,957,000	48.78	1910	138,808,000	2,090,000	1.5	181,944,000	7,004,000	3.9
Dutch possessions in America [23]	50,282	148,000	2.94	1910	4,414,000	1,489,000	33.7	4,045,000	1,342,000	33.2
Norway	124,675	2,392,000	19.19	1911	125,610,000	8,304,000	6.6	77,367,000	6,803,000	8.8
Paraguay	97,722	800,000	8.19	1911	6,306,000	[9] 171,000	2.7	4,700,000	[9] 36,000	.8
Persia	635,135	9,500,000	14.96	[24] 1912	41,898,000	54,000	.1	30,918,000	471,000	1.5
Peru	683,321	4,610,000	6.75	1911	31,006,000	6,078,000	19.6	36,119,000	10,202,000	28.2
Portugal (including Madeira and Azores) [5]	35,499	5,423,000	152.76	1911	74,605,000	[6] 2,591,000	3.5	37,242,600	[9] 5,562,000	14.9
Portuguese colonies [25]	808,107	8,580,000	10.53	1908–9	31,807,000	2,709,000	8.5	28,448,000	222,000	.8
Roumania [5]	50,715	7,087,000	139.74	1910	79,075,000	[9] 524,000	.7	118,985,000	[9] 91,000	.1
Russia [5]	8,361,708	166,108,000	19.87	1911	598,266,000	52,782,000	8.8	819,577,000	6,936,000	1.2
Finland	144,249	3,115,000	21.59	1911	85,750,000	[9] 2,720,000	3.2	61,277,000	[9] 169,000	.3
Santo Domingo	28,000	708,000	25.29	1911	6,950,000	4,120,000	59.3	11,005,000	5,761,000	60.4
Servia	18,650	2,957,000	158.55	1911	22,277,000	412,000	1.9	22,565,000	697,000	3.1
Siam [2, 26]	195,000	7,000,000	35.90	[11] 1912	27,354,000	599,000	2.2	31,653,000	38,000	.1
Spain [2, 5]	194,794	19,611,000	100.68	1911	178,082,000	23,202,000	13.0	174,779,000	10,330,000	5.
Sweden [2 14]	172,920	5,562,000	32.17	1910	179,998,000	14,116,000	7.8	158,888,000	6,052,000	3.
Switzerland [5]	15,955	3,753,000	235.23	1911	347,855,000	14,491,000	4.2	242,661,000	27,450,000	11.3
Turkey (including Samos)	1,153,500	24,867,000	21.56	[27] 1911	183,273,000	2,791,000	1.5	95,089,000	4,344,000	4.6
Crete [28]	3,327	344,000	103.40	1910	3,825,000	15,000	.4	3,238,000	73,000	2.3
Union of South Africa [29]	473,184	5,973,000	12.62	1911	170,062,000	13,763,000	8.1	267,206,000	2,234,000	.8
United Kingdom [4]	121,316	45,366,000	373.94	1911	3,309,987,000	597,125,000	18.0	2,209,972,000	135,042,000	6.1
British colonies. n. c. s. [3]	2,271,292	41,500,000	18.27	1910	471,352,000	30,572,000	6.5	443,947,000	43,203,000	9.7
United States (including Alaska, Hawaii, and Porto Rico) [4]	3,627,557	96,827,000	26.69	[16] 1912	1,653,265,000	....	....	2,170,320,000	....	....
Philippine Islands [14]	115,026	8,460,000	73.55	[16] 1912	54,550,000	20,604,000	37.8	50,320,000	21,518,000	42.8
Porto Rico	[6] 3,435	[6] 1,152,000	335.37	1912	....	....	....	....	....	....
Uruguay [5, 30]	72,172	1,178,000	16.32	1911	46,638,000	[9] 5,953,000	12.8	43,877,000	[9] 1,588,000	3.6
Venezuela	393,976	2,744,000	6.97	[16] 1912	20,396,000	6,236,000	30.6	25,732,000	8,368,000	32.5
Total	49,165,137	1,629,588,000	33.15	....	18,570,198,000	2,388,151,000	....	16,936,736,000	1,355,957,284	....
Total, exclusive of the commerce of the United States	....	....	....	....	16,916,948,000	2,388,151,000	14.1	14,766,416,000	1,355,957,284	9.2

COMMERCIAL AND FINANCIAL STATISTICS OF THE PRINCIPAL COUNTRIES OF THE WORLD—Continued.

Country.	Length of railways.		Telegraphs.			Post offices.	Miles of postal routes.	Miles of mail service performed.	Domestic money and postal orders sent.		Foreign money orders sent.	
	Date.	Miles.	Date.[31]	Miles of line.	Miles of wire.				Number.	Value.	Number.	Value.
										Dollars.		*Dollars.*
Argentina	1911	19,620	1910	37,905	100,336	2,995	45,372	17,867,249	238,864	5,264,986	23,473	391,822
Australasia:												
Commonwealth of Australia	1911	18,012	1910	44,100	96,825	7,834	132,242	35,960,962	7,304,104	37,813,386	3,806,378	22,705,610
New Zealand	[11] 1912	2,827	1911	11,316	37,212	[32] 2,312	....	....	413,314	9,639,057	156,343	2,313,362
Austria-Hungary	1911	28,638	....	....	....	....	....	....	....	....	....	....
Austria (including Bosnia and Herzegovina)	....	....	1910	31,723	154,268	10,272	144,201	83,988,587	31,559,283	308,655,218	5,783,857	66,946,960
Hungary	....	....	1910	15,576	89,554	6,152	63,974	51,939,283	21,404,004	227,828,281	4,549,372	53,071,260
Belgium	1912	5,303	1912	4,955	27,382	[32] 1,658	5,614	68,319,201	4,370,217	79,451,574	747,629	10,317,820
Kongo, Belgian	1912	770	1912	1,367	....	66	13,919	887,572	891	26,002	4,867	146,310
Bolivia	1911	635	1909	3,111	4,153	200	....	....	....	....	....	....
Brazil	1911	13,750	1909	36,199	73,124	[33] 3,246	....	....	....	....	....	....
Bulgaria	1911	1,198	1911	4,052	9,457	2,220	15,434	5,160,831	412,323	6,094,186	164,252	3,808,025
Canada	[16] 1911	25,400	1911	[34] 42,312	173,546	[35] 13,859	....	52,065,274	[35] 3,754,301	[35] 52,568,433	[35] 2,023,456	[35] 31,497,459
Central American States:												
Costa Rica	1911	427	1911	....	1,514	199	....	....	....	....	....	....
Guatemala	1911	422	1911	3,828	....	311	....	....	....	....	....	....
Honduras	1910	106	1910	3,220	....	264	....	....	....	....	....	....
Nicaragua	1910	171	1910	....	3,637	135	....	....	....	....	....	....
Panama	1912	202	....	....	....	96	....	....	....	....	....	....
Salvador	1910	97	1911	....	2,573	96	1,848	36,601	....	....	617	2,838
Chile	1911	3,606	1909	....	24,661	[32] 1,104	28,752	7,464,518	2,560,364	5,901,526	146,284	850,248
China	1911	5,404	1910	29,327	51,166	[32] 6,201	....	....	....	[32] 2,501,195	....	....
Colombia	1911	621	1909	10,676	....	500	....	....	....	....	....	....
Cuba	1910	2,123	1910	5,065	6,184	487	[36] 5,324	[36] 2,545,828	....	....	....	....
Denmark	1911	2,294	[11] 1912	2,265	8,052	1,574	6,437	9,715.803	4,323,200	48,003,083	242,882	3,159,968
Ecuador	1910	350	1912	3,318	....	81	....	....	....	....	....	....
Egypt	1911	3,639	1911	[37] 8,604	23,759	[32] 1,701	6,399	6,055,257	819,279	21,844,073	151,934	3,154,038
France	1911	31,223	1910	113,588	429,140	14,016	368,991	332,830,358	60,454,209	519,107,524	1,914,217	20,537,962
Algeria	1911	2,142	1910	9,444	24,639	661	8,228	8,104,042	2,180,158	75,825,364	36,792	547,751
Tunis	1911	1,080	1911	2,931	10,281	419	5,182	2,701,489	288,560	4,647,007	227,917	2,770,647
French Indo-China	1911	1,186	1911	8,738	15,805	315	20,840	6,865,688	174,302	4,095,374	99,629	2,051,350
French colonies, n. e. s.	1912	1,731	1908	16,556	21,897	617	37,717	6,845,886	129,433	3,931,094	99,629	2,125,914

German Empire	1912	38,654	1911	142,020	438,841	50,563	90,534	....	186,891,090	2,346,242,528	4,572,040	50,457,843
German colonies	1911	2,862	1909	4,973	5,989	188	....	....	469,340	22,107,195	([38])	([38])
Greece	1911	1,000	1910	5,052	9,665	1,082	....	....	207,322	3,236,816	35,475	453,198
Haiti	1911	64	1910	124	....	80	2,371	102,944	....	....	....	....
India, British	1911	32,839	[11] 1911	74,828	297,927	[39] 19,667	158,948	116,026,000	[39] 23,975,280	[39] 124,084,479	[39] 163,348	[39] 2,091,702
Italy, including Eritrea	1912	[40] 10,871	1910	[41] 34,655	182,405	11,124	42,78	62,578,017	24,064,001	496,239,303	476,377	7,174,475
Japan (including Pescadores but excluding Formosa)	[11] 1911	5,355	[11] 1911	[42] 23,595	[43] 104,564	[35] 7,717	70,869	77,087,161	17,055.517	116,541,935	21,751	328,714
Formosa	[11] 1911	291	[11] 1911	1,613	2,843	135	([43])	([43])	([43])	([43])	([43])	([43])
Chosen (Korea)	[11] 1912	767	[11] 1912	3,451	8,451	465	21,667	4,809,780	500,174	9,467,742	1,938	25,735
Luxemburg	1911	326	1911	436	1,281	124	785	1,100,754	252,881	5,802,428	399,456	8,162,059
Mexico	1912	16,103	1911	22,452	46,437	[44] 2,858	55,247	22,893,529	1,522,101	26,172,628	131,035	3,460,950
Netherlands	1911	2,010	1911	4,728	23,529	[33] 1,511	9,966	21,071,382	6,181,751	35,210,679	486,749	3,973,049
Dutch East Indies	1910	[45] 1,595	1910	9,430	13,968	1,703	1,621,345	7,112,676	509,057	6,742,800	73,566	889,403
Dutch possessions in America	1910	117	....	....	....	17	....	....	4,751	89,176	10,090	253,753
Norway	1911	1,917	1911	6,843	13,128	[33] 3,496	65,171	12,318,315	817,694	12,466,373	289,226	2,212,663
Paraguay	1911	232	1911	2,485	....	385	....	....	....	....	....	....
Persia	1910	34	1910	6,630	9,737	160	7,456	1,565,852	....	....	282	850
Peru	1911	1,656	1911	7,950	....	714	....	....	34,668	966,487	5,274	94,574
Portugal	1911	1,798	1908	5,795	13,484	4,044	20,333	12,307,175	767,362	10,850,547	51,608	499,068
Portuguese colonies	1910	1,002	1910	5,841	7,143	773	26,842	2,879,607	16,861	268,428	29,575	408,068
Roumania	1912	2,293	1911	4,549	12,950	2,979	64,697	17,255,010	1,691,559	13,013,575	389,243	4,253,603
Russia	1911	46,038	1910	[46] 126,559	443,795	15,701	209,891	92,268,403	39,710,581	1,077,529,663	663,799	10,836,142
Finland	1911	2,338	....	([47])	([47])	2,138	([47])	([47])	([47])	([47])	([47])	([47])
Santo Domingo	1911	175	1911	1,269	....	81	....	....	....	....	....	....
Servia	1911	590	1911	2,703	5,150	1,529	2,107	835,350	460,561	7,080,257	48,562	741,913
Siam	1911	677	1911	4,527	6,604	179	4,954	474,088	4,796	310,986	2,424	29,437
Spain	1911	9,199	1911	28,441	58,056	5,674	37,091		....	....	....	....
Sweden	1911	8,682	1910	6,383	20,020	4,056	40,403	28,364,288	7,304,614	67,758,990	386,732	3,562,004
Switzerland	1911	3,176	1911	2,221	16,346	4,230	7,653	20,466,402	6,349,307	119,134,991	1,810,708	15,636,730
Turkey	1910	4,138	1910	28,251	47,683	[48] 929	29,938	5,592,951	[48] 1,091,098	[48] 15,963,695	[48] 16,568	[48] 156,433
Crete	....	....	1909	229	....	[49] 28	....	....	[49] 40,280	[49] 587,371	[49] 7,328	[49] 102,500
Union of South Africa	1911	8,092	1911	14,920	54,983	2,587	....	....	....	....	484,207	12,981,797
United Kingdom	1911	23,417	[11] 1911	[50] 61,296	[50] 1,239,095	24,245	....	....	139,309,732	438,596,870	852,760	14,786,588
British colonies, n. e. s.	1911	6,828	1911	27,883	....	2,392	....	....	....	....	....	....
United States	[16] 1911	[51] 254,732	1912	[52] 220,928	[52] 1,517,317	[53] 58,729	436,470	578,165,267	84,539,212	583,337,004	4,455,941	97,660,025
Philippine Islands	[16] 1912	643	1912	4,803	6,687	587	....	....	....	5,592,201	....	1,832,973
Porto Rico	[16] 1912	340	1912	590	1,400	([53])	([53])	([53])	([53])	([53])	([53])	([53])
Uruguay	1911	1,561	1910	4,849	....	[33] 1,031	....	....	....	....	....	....
Venezuela	1911	575	1911	4,721	....	[33] 284	....	....	....	....	....	....
Total	....	686,964	....	1,355,694	5,998,593	313,776	3,937,993	1,785,280,441	682,170,996	6,958,592,505	36,046,175	470,065,593

COMMERCIAL AND FINANCIAL STATISTICS OF THE PRINCIPAL COUNTRIES OF THE WORLD—Continued.

Country.	Revenue and expenditure.			Debt.							
	Year.	Revenue.[54]	Expenditure.[54]	Year.	Funded.		Unfunded, including floating, noninterest bearing, etc.		Total in United States currency.	Rates of interest.	Interest and other annual charges.
					Currency.	Amount.	Currency.	Amount.			
		Dollars.	Dollars.						Dollars.	Per ct.	Dollars.
Argentina	1912	140,825,000	134,488,000	1912	Pesos, gold	474,459,000	Pesos, paper	24,318,000	670,428,000	4-6	32,528,000
					Pesos, paper	476,330,000					
Australasia:											
Commonwealth of Australia	1910-11	[55] 66,200,000	[55] 64,036,000	1912	....	....	Lbs. sterling	10,048,000	48,901,000	....	....
Australia, States	1910-11	[55] 181,840,000	[55] 181,274,000	1911	Lbs. sterling	253,491,000	....do	13,636,000	1,299,975,000	3-4	50,489,000
New Zealand	1910-11	[55] 68,345,000	[56] 63,603,000	1911	....do	81,078,000	....	....	394,567,000	3-4	11,964,000
Austria-Hungary	1911	92,954,000	92,954,000	1912	Kronen	5,178,080,000	Kronen	964,000	1,051,346,000	3-5	42,695,000
Austria	1912	592,149,000	592,087,000	1912	....do	6,711,295,000	....do	350,333,000	1,433,511,000	3-5	53,145,000
Hungary	1912	376,108,000	376,097,000	1910	....do	5,075,376,000	....do	957,517,000	1,224,677,000	3-5	60,423,000
Belgium	1912	136,751,000	136,751,000	1911	Francs	3,703,404,000	Francs	136,204,000	741,044,000	2½-3	29,567,000
Kongo, Belgian	1912	8,756,000	13,309,000	1912	....do	238,485,000	....do	45,150,000	54,741,000	3-4	1,490,000
Bolivia	1912	6,711,000	6,757,000	1912	Lbs. sterling	2,735,000	....	....	13,311,000	3-10	1,348,000
					....do	82,903,000					
Brazil	1912	167,320,000	177,592,000	1912	Francs	300,000,000	....	....	663,667,000	4-5	29,637,000
					Milreis, paper	620,526,000					
Bulgaria	1912	36,723,000	36,463,000	1912	Francs	600,469,000	Francs	100,567,000	135,300,000	4½-6	7,749,000
Canada	1911	[55] 117,780,000	[55] 87,774,000	1911	Dollars	275,846,000	Dollars	199,095,000	474,941,000	2½-4	14,116,000
Central American States:											
Costa Rica	1912-13	4,138,000	4,127,000	1912	Lbs. sterling	1,617,000	....	....	14,624,000	4-5	706,000
					Francs	35,000,000					
Guatemala	1911	[56] 3,723,000	[56] 4,150,000	1912	Pesos, gold	11,658,000	Pesos, paper	103,129,000	17,846,000	4-8	1,761,000
Honduras	1912-13	2,126,000	2,126,000	1912	Lbs. sterling	23,861,000	Pesos, silver	5,458,000	118,301,000	5-10	282,000
Nicaragua	1910	[55] 1,518,000	[55] 1,205,000	1912	....do	1,209,000	Pesos, paper	59,417,000	9,641,000	6	394,000
Panama	1911	[56] 3,366,000	[56] 3,360,000	1912	....	....	U. S. dollars	51,000	51,000	7	4,000
Salvador	1911	[55] 5,391,000	[55] 5,177,000	1911	U. S. dollars	8,039,000	....do	2,627,000	13,149,000	2-6	1,454,000
					Colones, silver	3,620,000	Colones, silver	2,587,000			
					Lbs. sterling	34,729,000					
Chile	1911	[55] 72,227,000	[56] 72,675,000	1912	Pesos, gold	6,008,000	Pesos, paper	150,864,000	210,136,000	4½-5	8,212,000
					Pesos, paper	29,730,000					
China	1912	193,261,000	375,147,000	1911	Lbs. sterling	111,584,000	....	....	636,822,000	4-5	33,696,000
					Francs	486,000,000					
Colombia	1912	11,115,000	11,115,000	1912	Lbs. sterling	4,255,000	Dollars	2,757,000	23,465,000	3-6	2,544,000
Cuba	1911	[56] 44,116,000	[56] 44,001,000	1911	Dollars	61,319,000	....	....	61,319,000	4½-6	4,628,000
Denmark	1911-12	25,592,000	31,329,000	1911	Kroner	335,860,000	....	....	90,010,000	3-3½	3,060,000

Ecuador	1913	9,921,000	9,921,000	1912	Sucres	42,316,000			20,593,000	4–10	1,100,000
Egypt	1912	78,594,000	76,122,000	1912	Lbs. sterling	94,622,000			460,476,000	3– 4	22,682,000
France	1912	868,178,000	868,107,000	1912	Francs	31,162,001,000	Francs	1,395,898,000	6,283,675,000	2½– 3	185,775,000
Algeria	1912	28,017,000	28,015,000	1909	do	53,313,000			10,289,000	3½	3,291,000
Tunis	1912	10,519,000	10,518,000	1911	do	357,182,000			68,936,000	3– 3½	2,989,000
French Indo-China	1911	25,454,000	25,454,000	1912	do	245,913,000			47,461,000	2½– 3½	2,153,000
Fr. colonies, n. e. s.	1911	26,413,000	25,313,000	1912	do	308,460,000			59,533,000	3– 4	2,835,000
German Empire	1912–13	686,900,000	686,900,000	1911	Marks	4,523,657,000	Marks	600,000,000	1,219,430,000	3– 4	57,128,000
German States	1911	1,426,309,000	1,400,553,000	1911	do	14,879,654,000	do	690,742,000	3,705,754,000	3– 4	158,726,000
German colonies	1912–13	15,062,000	30,204,000	1910	do	84,580,000			20,130,000		1,464,000
Greece	1912	27,815,000	27,662,000	1912	Lbs. sterling Drachmas	33,343,000 88,234,000			177,910,000	2½– 5	7,069,000
Haiti	1912–13	6,244,000	6,244,000	1912	Francs U. S. dollars	119,286,000 12,763,000	U. S. dollars	7,077,000	42,863,000	2½– 5	2,984,000
India, British	1911–12	396,366,000	382,983,000	1910	Lbs. sterling	261,335,000	Rupees	237,974,000	1,348,992,000	3– 3½	47,576,000
Italy	1912–13	510,677,000	507,623,000	1911	Lire	10,055,378,000	Lire	3,777,512,000	2,669,748,000	3– 5	97,074,000
Japan	1912–13	286,837,000	286,837,000	1912	Yen	2,553,705,000			1,271,745,000	4– 5	70,877,000
Formosa	1912–13	22,572,000	22,572,000								
Chosen (Korea)	1912–13	26,340,000	26,340,000	1912	Yen	29,255,000			14,569,000	6– 6½	1,189,000
Liberia	1910–11	[55] 490,000	[55] 490,000	1912	U. S. dollars	1,700,000			1,700,000	5	85,000
Luxemburg	1912	3,608,000	3,982,000	1910	Francs	10,835,000			2,091,000	3½	261,000
Mexico	1910–11	[56] 55,349,000	[56] 60,812,000	1911	Pesos	439,704,000	Pesos	483,000	219,213,000	3– 5	14,418,000
Netherlands	1912	81,231,000	89,251,000	1912	Florins	1,163,456,000			467,709,000	2½– 3	15,213,000
Dutch East Indies	1912	94,053,000	106,877,000								
Dutch possessions in America	1912	2,732,000	3,256,000								
Norway	1910–11	[55] 33,073,000	[55] 32,403,000	1911	Kroner	367,653,000			98,531,000	3– 3½	4,120,000
Paraguay	1912	3,564,000	4,075,000	1912	Pesos, gold Pesos, paper	5,335,000 12,405,000	Pesos, gold Pesos, paper	583,000 16,618,000	7,643,000	3– 7	835,000
Peru	1912	16,826,000	16,826,000	1911	Lbs. sterling	3,843,000	Lbs. sterling	1,552,000	26,253,000	1– 5½	542,000
Portugal	1912–13	81,663,000	85,802,000	1912	Milreis	807,535,000	Milreis	89,061,000	968,324,000	3– 5	37,999,000
Portuguese colonies	1910–11	[56] 12,345,000	[56] 12,600,000								
Roumania	1912–13	97,590,000	96,606,000	1911	Francs	1,523,634,000			294,061,000	4– 5	17,582,000
Russia	1913	[56] 1,637,259,000	[56] 1,652,330,000	1912	Rubles	8,941,641,000			4,604,945,000	3– 6	207,497,000
Finland	1910	[55] 32,911,000	[55] 33,543,000	1911	Francs	178,029,000			34,360,000	3– 4½	1,635,000
Santo Domingo	1911	[55] 4,860,000	[55] 4,806,000	1912	Dollars	14,646,000			14,646,000	5	1,844,000
Servia	1912	[56] 25,238,000	[56] 25,238,000	1912	Francs	663,617,000			128,078,000	2– 5	6,269,000
Siam	1911–12	[55] 23,180,000	[55] 23,149,000	1911	Lbs. sterling	2,083,000			10,135,000	4½	456,000
Spain	1911	[55] 202,531,000	[55] 187,210,000	1912	Pesetas	9,407,725,000			1,815,691,000	4– 5	73,074,000
Sweden	1913	70,491,000	70,491,000	1911	Kronor	537,426,000			144,030,000	3– 4	8,130,000
Switzerland	1912	17,903,000	18,640,000	1912	Francs	116,700,000	Francs	5,651,000	23,614,000	3– 3½	1,384,000
Turkey	1912–13	134,262,000	152,198,000	1912	Lbs. Turkish	126,009,000			554,441,000	3½– 4	64,271,000
Union of South Africa	1912–13	[56] 78,409,000	[56] 81,670,000	1910	Lbs. sterling	110,382,000	Lbs. sterling	5,950,000	566,129,000	3– 5	15,862,000
United Kingdom	1911–12	[55] 900,742,000	[55] 868,890,000	1912	do	685,306,000	do	39,500,000	3,527,270,000	2½– 2¾	119,229,000
Br. colonies, n. e. s.	1910–11	[55] 100,603,000	[55] 92,417,000	1910	do	38,259,000			186,190,000	3– 4	6,556,000
United States	1911–12	[55] 992,249,000	[55] 965,274,000	1912	Dollars	963,777,000	Dollars	63,798,000	1,027,575,000	2– 4	22,616,000
Philippine Islands	1911–12	[55] 14,893,000	[55] 15,104,000	1912	do	16,125,000			16,125,000	4	713,000
Uruguay	1911–12	34,702,000	34,676,000	1912	Pesos	131,858,000			136,341,000	3½– 5	8,593,000
Venezuela	1912–13	10,133,000	10,133,000	1911	Bolivares	195,489,000	Bolivares	2,319,000	37,729,000	3	1,275,000
Total		11,574,143,000	11,687,714,000						41,736,701,000		1,686,763,000

COMMERCIAL AND FINANCIAL STATISTICS OF THE PRINCIPAL COUNTRIES OF THE WORLD—Continued.

Country.	Per capita.						Railroads.		Telegraph.		Post offices per 10,000 inhabitants.
	Imports.	Exports.	Revenue.	Expenditure.	Debt.	Interest.	Per 10,000 inhabitants.	Per 1,000 square miles.	Length of line per 10,000 inhabitants.	Length of wire per 10,000 inhabitants.	
	Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Miles.*	*Miles.*	*Miles.*	*Miles.*	*Number.*
Argentina	49.35	43.69	19.64	18.75	93.48	4.54	27.4	17.2	52.9	139.9	4.2
Australasia:											
Commonwealth of Australia	70.82	80.59	14.39	13.91	10.63		39.2	6.1	95.9	210.5	17.0
New Zealand	89.48	87.11	64.31	59.85	371.27	11.26	26.7	27.0	16.7	350.0	21.7
Austria-Hungary	12.68	9.55	1.82	1.82	20.57	.84	5.6	109.7			
Austria			20.91	20.91	50.62	1.88			11.2	54.5	3.4
Hungary			18.01	18.01	58.64	2.89			7.5	42.9	2.9
Belgium	111.14	91.11	18.19	18.19	98.58	3.93	7.1	466.3	6.6	36.4	2.2
Kongo, Belgian	.47	.52	.44	.66	2.74	.07	.4	.8	.7		.03
Bolivia	10.61	14.39	2.96	2.98	5.87	.59	2.8	.9	13.7	18.3	.9
Brazil	12.16	15.39	7.92	8.41	31.43	1.40	6.5	4.2	17.1	34.6	1.5
Bulgaria	7.91	5.75	8.48	8.42	31.25	1.79	32.8	32.4	9.4	21.8	5.1
Canada	72.37	40.28	16.63	12.29	67.06	1.99	5.9	6.8	59.7	245.1	19.2
Central American States:											
Costa Rica	22.78	22.91	10.67	10.64	37.60	1.82	11.0	23.1		39.1	5.1
Guatemala	3.21	5.41	1.83	2.04	8.79	.87	2.1	8.7	18.8		1.5
Honduras	5.61	5.42	3.76	3.76	209.01	.50	1.9	2.3	56.9		4.7
Nicaragua	4.77	7.59	2.53	2.01	16.07	.66	2.8	3.5		60.6	2.2
Panama	25.57	7.40	8.70	8.68	.13	.01	5.2	6.2			2.5
Salvador	3.10	4.92	3.16	3.08	7.70	.85	.6	12.1		15.1	.6
Chile	37.30	36.28	21.08	21.24	61.53	2.40	10.6	12.3		72.2	3.2
China	.91	.73	.58	1.12	1.90	.10	.2	1.3	.9	1.5	.2
Colombia	3.60	4.46	2.21	2.21	4.66	.51	1.2	1.4	21.2		1.0
Cuba	53.58	66.07	19.87	19.82	27.62	2.08	9.6	46.4	22.8	27.9	2.2
Denmark	68.58	52.16	9.28	11.36	32.65	1.11	8.3	153.8	8.2	29.2	4.1
Ecuador	5.35	9.10	4.40	7.15	13.79	.73	2.3	3.0	22.1		.5
Egypt	11.92	12.52	6.96	6.74	40.80	2.01	3.2	9.5	7.7	21.1	1.5
Sudan	4.32	2.62									
France	39.31	29.62	21.92	21.92	158.67	4.69	7.9	150.8	28.7	108.4	3.5
Algeria	19.82	17.68	5.04	5.04	1.85	.59	3.9	16.2	17.0	44.3	1.2
Tunis	12.17	14.37	5.45	5.45	35.74	1.55	5.6	6.7	15.2	53.3	2.1
French Indo-China	2.17	2.83	1.50	1.50	2.79	.13	.7	4.6	5.1	9.3	.2
French colonies, n. e. s.	2.46	2.42	1.06	1.01	2.37	.09	.7	.5	6.6	8.7	.2

German Empire			10.58	10.58	18.78	.88	6.0	185.1	21.9	67.6	7.8
German Customs Union	35.43	29.58									
German States			21.99	21.57	57.08	2.44					
German colonies	2.21	1.72	1.08	2.16	1.44	.10	2.0	2.8	3.6	4.3	.1
Greece	11.62	10.47	10.43	10.38	66.73	2.65	3.8	40.2	19.0	36.3	4.1
Haiti	3.18	7.42	2.50	2.50	17.15	1.19	.3	5.8	.5		.3
India, British	1.43	2.28	1.26	1.22	4.28	.15	1.0	18.6	2.4	9.5	.6
Italy	18.86	12.26	14.72	14.64	76.97	2.80	3.1	98.3	10.0	52.6	3.2
Eritrea (Massoua)	11.83	5.04									
Japan (including Pescadores, but excluding Formosa and Sakhalin)	4.96	4.28	5.65	5.65	25.06	1.40	1.1	36.3	4.6	20.6	1.4
Formosa	7.82	9.49	6.65	6.65			.9	21.1	4.8	8.4	.4
Chosen (Korea)	1.92	1.34	1.87	1.87	1.04	.08	.5	.9	2.5	6.0	.3
Liberia	.70	.64	.38	.38	1.13	.06					
Luxemburg			13.88	15.32	8.04	1.00	12.5	326.0	16.8	49.3	4.8
Mexico	6.02	9.82	3.66	4.02	14.50	.95	10.7	21.0	14.9	30.7	1.9
Morocco	3.64	3.23									
Netherlands	154.58	181.14	13.49	14.82	77.67	2.53	3.3	152.6	7.9	39.1	2.5
Dutch East Indies	3.66	4.79	2.48	2.82			.4	2.0	2.5	3.7	.4
Dutch possessions in America	29.82	28.01	18.46	22.00			7.9	2.3			1.1
Norway	52.51	32.34	13.83	13.55	41.19	1.72	8.0	15.3	28.6	54.9	14.6
Paraguay	7.88	5.88	4.45	5.09	9.55	1.04	2.9	2.4	31.1		4.8
Persia	4.41	3.25					.04	.06	7.0	10.2	.2
Peru	6.73	7.83	3.65	3.65	5.70	.12	3.6	2.4	17.2		1.4
Portugal (including Madeira and Azores)	13.76	6.87	14.64	14.10	178.56	7.00	3.3	50.8	10.7	24.9	7.5
Portuguese colonies	3.71	3.32	1.44	1.47			1.2	1.2	6.8	8.3	.9
Roumania	11.16	16.79	13.77	13.68	41.49	2.48	3.2	45.2	6.4	18.3	4.2
Russia	3.60	4.93	9.86	9.95	27.72	1.25	2.8	5.5	7.6	26.7	.9
Finland	27.53	19.67	10.57	10.77	11.03	.52	7.5	16.2			6.9
Santo Domingo	9.82	15.54	6.86	6.79	20.69	2.60	2.5	6.3	17.9		1.1
Servia	7.53	7.63	8.54	8.54	43.31	2.12	2.0	31.6	9.1	17.4	5.2
Siam	3.91	4.52	3.71	3.71			1.0	3.0	6.5	9.4	.3
Spain	9.08	3.91	10.33	9.55	92.59	3.73	4.7	47.2	13.5	29.6	2.8
Sweden	32.36	28.57	12.67	12.67	25.90	1.46	15.6	50.2	11.5	36.0	7.3
Switzerland	92.69	66.66	4.77	4.97	6.29	.37	8.5	198.5	5.9	43.6	11.2
Turkey	7.37	3.82	5.40	6.12	22.30	2.58	1.7	3.6	11.4	19.2	.4
Crete	11.12	9.41							6.7		.8
Union of South Africa	28.47	44.74	13.13	13.67	94.78	2.66	13.5	17.1	25.0	92.0	4.3
United Kingdom	72.96	48.71	19.86	19.15	77.75	2.63	5.2	193.1	13.5	273.1	5.3
British colonies, n. e. s	11.36	10.70	2.43	2.23	4.49	.16	1.6	3.0	6.7		.6
United States	17.07	22.41	10.25	9.97	10.61	.23	26.6	70.3	23.1	158.6	6.1
Philippine Islands	6.45	5.95	1.54	1.65	1.95	.11	.7	5.3	5.2	8.0	.7
Porto Rico							3.0	99.0	5.3	12.5	
Uruguay	39.59	37.25	29.46	29.44	115.74	7.29	13.3	21.7	41.2		8.8
Venezuela	7.43	9.38	3.69	3.69	13.75	.46	2.1	1.5	17.2		1.0

1 Figures include merchandise only, special trade, and cover calendar years, unless otherwise stated.
2 Figures of commerce include bullion and specie.
3 Territory of Papua not included. Commerce exclusive of intercolonial trade.
4 Figures of commerce include total imports and exports of domestic produce.
5 Figures of commerce include imports for consumption and domestic exports.
6 Not included in grand totals of area and population.
7 Figures of commerce include merchandise only. Exports include raw gold.
8 Specie not included in figures of commerce.
9 From United States returns. Exports from the United States to, and imports into the United States from, the respective countries.
10 Commerce includes bullion and foreign coins.
11 Year ending Mar. 31.
12 Year ending July 31.
13 Commerce of Canal Zone not included.
14 Figures of commerce include total imports and domestic exports.
15 Figures of commerce include gold and silver bullion, but not coin.
16 Year ending June 30.
17 Exclusive of Kiauchau, the figures of which are included in the Chinese trade. In 1910 this trade amounted to: Imports, $16,511,000; exports, $14,414,000.
18 Trade with the United States not stated separately, but is included with "Total America."
19 Government stores included in imports, but not in exports. Area and population include feudatory States.
20 Figures of commerce include trade with Japan.
21 Imports through post offices not included in figures of commerce.
22 Figures of commerce include imports and exports for Government. Exports to "Total America" include $403,000 "for orders."
23 Original returns for Curaçao do not show total trade by countries, and figures of trade with the United States have been taken from United States returns and combined with Surinam reports to show the trade of the United States with the "Dutch possessions in America."
24 Year ending Mar. 20.
25 Include transit trade figures of Macao. Figures of trade with the United States (see note 9) are for the calendar year 1908.
26 Figures of commerce include trade of Bangkok only.
27 Year ending Mar. 13. The official figures of commerce do not include tobacco, cigars, and cigarettes imported or exported under control of the Imperial Tobacco Régie, or wine and salt exported under control of the Public Debt Administration. These amounted to $558,000 imports and $14,281,000 exports.
28 Figures of trade with the United States are for the calendar year 1908, no later data having been published.
29 Figures of commerce include bullion and specie and articles for Government.
30 Figures of commerce are those of special trade, including bullion, but not coin.
31 Postal figures are for calendar year 1910, unless otherwise stated.
32 Calendar year 1911.
33 Figures for fiscal year ending June 30, 1908.
34 Includes cable lines.
35 Year ending Mar. 31, 1912.
36 Figures for 1907.
37 Includes length of line in the Sudan.
38 Included with domestic money orders.
39 Postal data for year ending Mar. 31, 1910.
40 Includes 47 miles in Eritrea.
41 Includes 1,074 miles in Eritrea.
42 Including 507 miles of line and 646 miles of wire in Japanese Sakhalin.
43 Included with Japan.
44 Postal data for year ending June 30, 1911.
45 Exclusive of 1,632 miles of local railways.
46 Includes police, railway, and private lines.
47 Included with Russia.
48 Postal data for year ending Feb. 28, 1911.
49 Postal data for year ending Aug. 31, 1910.
50 Includes telephones.
51 Exclusive of railway mileage in Alaska (404 miles) and Hawaii (176 miles), and of mileage of switching and terminal companies.
52 Data for Western Union Telegraph Co. only.
53 Postal data for the United States are for the fiscal year 1912; data for Porto Rico included.
54 Budget law unless otherwise stated.
55 Actual revenue and expenditure.
56 Estimates submitted to the legislature.

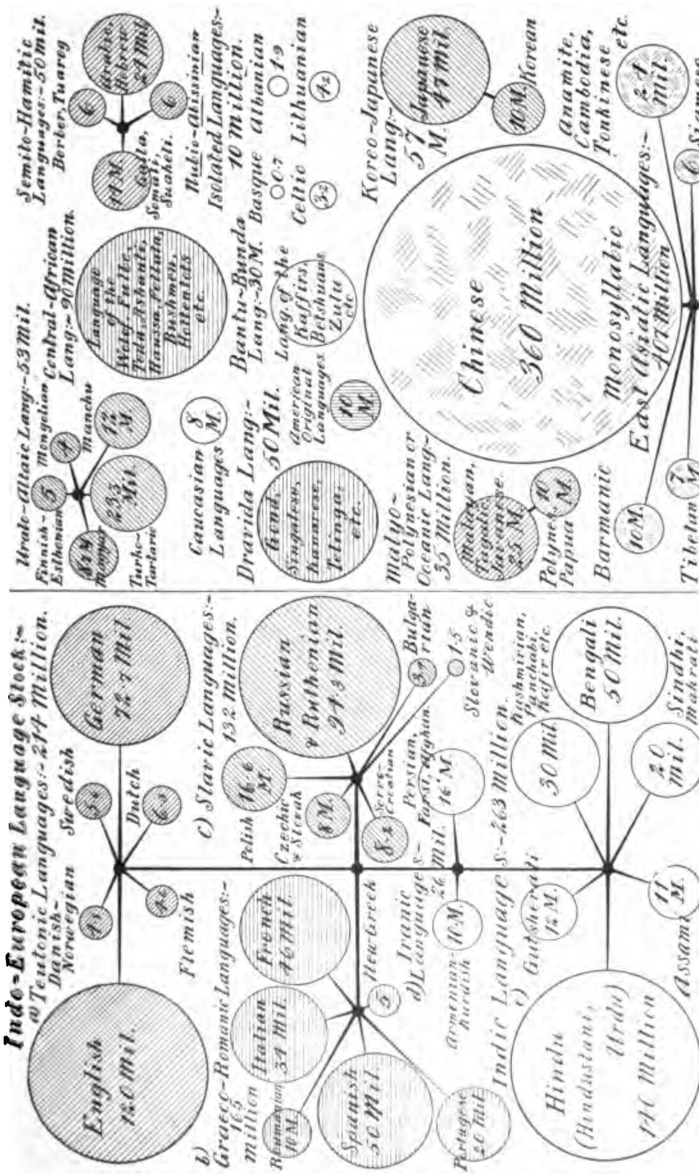
The domestic exports of the United States for the second time crossed the two billion dollar mark at the end of the fiscal year 1912, the total value of the domestic merchandise exported being $2,170,319,828, while the foreign merchandise exported showed a total of $34,002,581, making the grand total of exports $2,204,322,409. Imports amounted to $1,653,264,934 in the immediately preceding year, making the total foreign commerce $3,857,587,343. The excess of exports over imports was $551,057,475, against $522,094,094 in 1911 and $188,037,290 in 1910.

EXPORTS AND IMPORTS.

IMPORTS AND EXPORTS BY GRAND DIVISIONS AND COUNTRIES.

Imports from Europe were valued at 819½ million in the fiscal year 1912, against 768 million in the preceding fiscal year; from North America, 334 million dollars in 1912, against 305½ million in 1911; from South America, 215 million dollars, against 182½ million in the preceding year; from Asia, 225½ million against 213½ million in the earlier year; from Oceania, 36½ million, against 30 million in 1911; and from Africa, 22½ million in the fiscal year 1912, against 27 million in the preceding year.

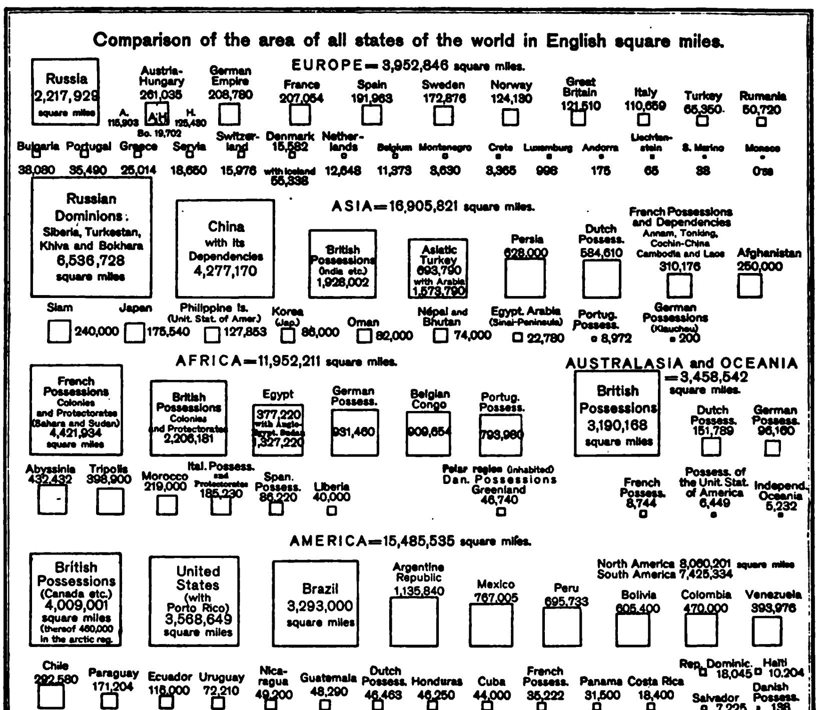
Turning to exports, the figures of the value of merchandise sent out of the United States show larger totals in exports to practically all the important countries of the world and to all of the grand divisions. To Europe the total for the fiscal year 1912 was 1,341¾ million dollars, against 1,308 in 1911; to North America, 516¾ million dollars in 1912, against 457 million in the preceding year; to South America, 132 million, against 109 million in 1911; to Asia, 117½ million, against 85 million in the preceding year; to Oceania, 72 million, against 66 million in 1911; to Africa, 24 million in 1912, against 23½ million in the prior year.



LANGUAGES OF THE WORLD.

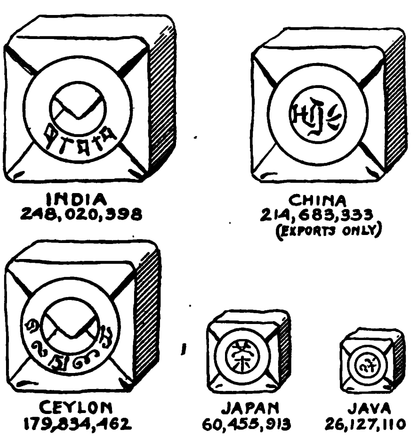
FOREIGN CARRYING TRADE OF THE UNITED STATES, 1821–1912.

Year	Total imports and exports.				
	In cars and other land vehicles.	By sea.			Per cent. carried in American vessels.
		In American vessels.	In foreign vessels.	Total.	
1821	....	$113,201,462	$14,358,235	$127,559,697	88.7
1830	....	129,918,458	14,447,970	144,366,428	89.9
1840	....	198,424,609	40,802,856	239,227,465	82.9
1850	....	239,272,084	90,764,954	330,037,038	72.5
1860	....	507,247,757	255,040,793	762,288,550	66.5
1870	....	352,969,401	638,927,488	991,896,889	35.6
1880	$20,981,393	258,346,577	1,224,265,434	1,482,612,011	17.4
1890	73,571,263	202,451,086	1,371,116,744	1,573,567,830	12.9
1900	154,895,650	195,084,192	1,894,444,424	2,089,528,616	9.3
1910	319,132,528	260,837,147	2,721,962,475	2,982,799,622	8.7
1911	365,903,334	280,206,464	2,930,436,506	3,210,642,970	8.7
1912	426,116,920	322,451,565	3,109,018,858	3,431,470,423	9.4



Trade With the Non-Contiguous Territories of the United States.

The trade of the United States with its non-contiguous territories continued to expand, the figures of 1912 showing a larger amount than ever before. The value of the merchandise forwarded to the non-contiguous territories was: To Alaska, 19½ million dollars, against 16 million in 1911: to Porto Rico, 38½ million in 1912, against 34½ million in 1911; to Hawaii, 24½ million, against 22 million in 1911; to the Philippine Islands, 20½ million, against 19½ million in the preceding year. This makes the total value of the merchandise shipped to the non-contiguous territories of the United States 103 million dollars in 1912, against 92½ million in 1911, and 83 million in 1910. The merchandise entering the United States from its non-contiguous territories shows in most cases larger totals in 1912 than in the preceding years. From Alaska the value of such shipments was 21¾ million dollars in 1912, against 14 million in the preceding year; from Porto Rico, 42¾ million, against 34¾ million in 1911; from Hawaii, 55 million, against 41 million in 1911; and from the Philippine Islands, 21½ million, against 16¾ million in the preceding year. This makes the total value of the merchandise shipped to the United States from its non-contiguous territories 141 million dollars in 1912, against 107½ million in 1911, 108 million in 1910, and 89½ million in 1909.



TEA.
A YEAR'S PRODUCTION.
(In lbs.)

MERCHANDISE IMPORTED: Value and Per Cent. of Total Value, in Specified Years, 1821 to 1911 by Great Groups.

Year ended June 30.	Foodstuffs in crude condition, and food animals. Value.	Per ct.	Foodstuffs partly or wholly manufactured. Value.	Per ct.	Crude materials for use in manufacturing. Value.	Per ct.	Manufactures for further use in manufacturing Value.	Per ct.	Manufactures ready for consumption. Value.	Per ct.	Miscellaneous. Value.	Per ct.	Total value.
	Dollars.		*Dollars.*		*Dollars.*		*Dollars.*		*Dollars.*		*Dollars.*		*Dollars.*
1821.....	6,081,641	11.15	10,820,814	19.85	1,983,706	3.64	4,079,064	7.48	30,998,900	56.86	556,709	1.02	54,520,834
1830.....	7,382,274	11.77	9,653,971	15.39	4,214,825	6.72	5,152,486	8.22	35,734,837	56.97	582,563	.93	62,720,956
1840.....	15,273,321	15.54	15,188,845	15.46	11,510,245	11.71	11,356,196	11.56	44,300,005	45.09	630,094	.64	98,258,706
1850.....	18,011,659	10.38	21,465,776	12.37	11,711,266	6.75	26,163,152	15.08	95,312,499	54.93	845,174	.49	173,509,526
1860.....	35,743,826	10.11	53,771,067	15.26	37,073,022	10.48	23,613,395	6.67	199,878,690	56.52	3,536,119	1.00	353,616,119
1870.....	53,981,838	12.38	96,253,561	22.08	53,118,022	12.18	54,545,306	12.51	173,034,847	39.69	5,024,834	1.16	435,958,408
1880.....	100,297,040	15.01	118,125,216	17.69	131,861,617	19.74	110,779,516	16.59	196,587,405	29.43	10,303,952	1.54	667,954,746
1890.....	128,480,142	16.28	133,332,031	16.89	170,637,250	21.62	116,924,080	14.81	230,685,581	29.23	9,251,325	1.17	789,310,409
1900.....	97,916,293	11.52	133,027,374	15.65	276,241,152	32.50	134,222,045	15.79	203,126,341	23.90	5,407,979	.64	849,941,184
1910.....	144,776,636	9.30	181,566,572	11.66	566,270,770	36.37	285,138,373	18.31	367,723,367	23.62	11,471,712	.74	1,556,947,430
1911.....	181,194,863	11.87	172,006,501	11.26	511,362,140	33.48	289,785,652	18.84	361,422,180	23.67	13,454,769	.88	1,527,226,105
1912.....	230,358,230	13.93	196,100,608	11.86	555,986,041	33.63	293,739,184	17.77	360,018,963	21.78	17,061,958	1.03	1,653,264,934

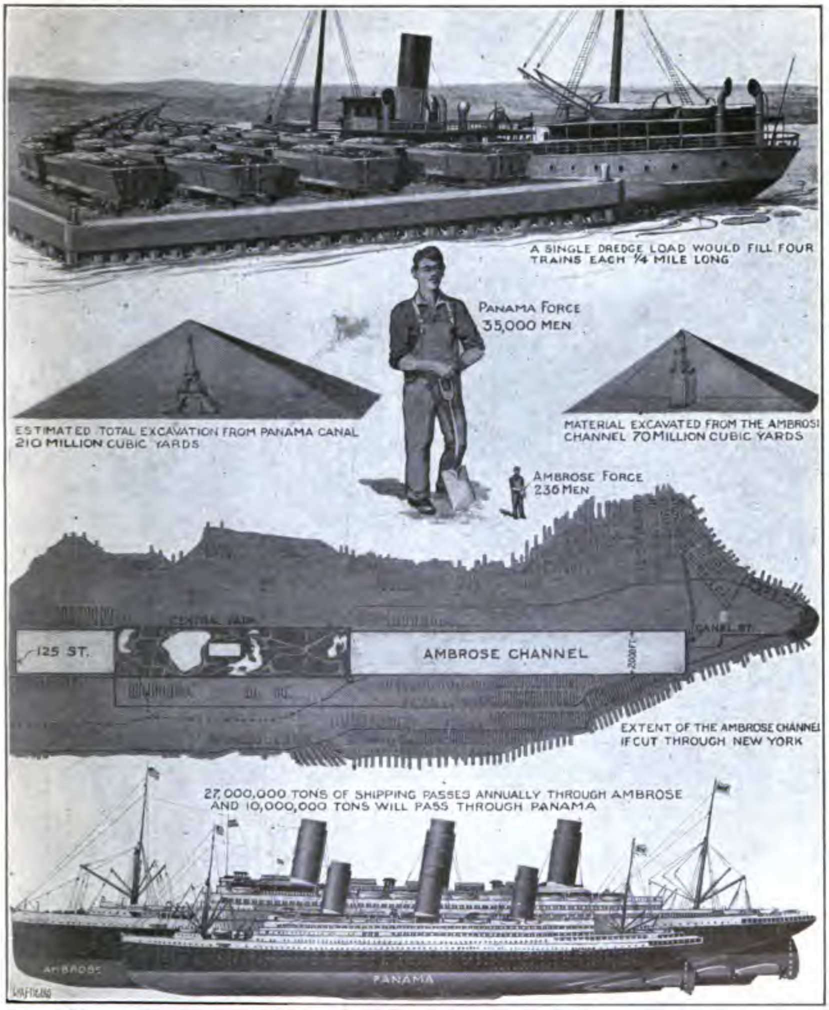
Imports Into the United States of Principal Crude Articles for Use in Manufacturing for Specified Years, 1870–1912.

[These ten groups embrace about three-fourths of the value of crude materials imported for use in manufacturing.]

Years ending June 30—	Fibers, unmanufactured.	Silk, raw.	India rubber, gutta-percha, and substitutes for.	Hides and skins.	Furs and fur skins, undressed.	Chemicals, drugs, and dyes.	Wool, raw.	Cotton, raw.	Wood, unmanufactured.	Tin in bars, blocks, etc.
	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.
1870	6,043,102	3,017,958	3,459,665	14,402,339	2,236,229	11,265,451	6,743,350	831,573	670,131	1,984,238
1875	6,236,099	4,504,306	4,675,490	18,536,902	4,530,753	11,726,955	11,071,259	408,808	1,895,585	2,327,212
1880	9,392,868	13,837,809	9,606,239	30,002,254	2,496,277	17,859,662	23,727,650	591,120	2,884,579	6,223,176
1885	12,302,498	12,925,437	9,095,256	20,586,443	1,854,282	12,057,527	8,879,923	954,760	3,587,651	4,283,460
1890	20,541,767	24,331,867	14,854,512	21,881,886	2,165,213	15,434,869	15,264,083	1,392,728	4,254,789	6,898,909
1891	21,286,705	19,076,081	18,020,804	27,930,759	2,822,166	18,605,987	18,231,372	2,825,004	5,288,264	7,977,545
1892	19,124,094	25,059,325	19,833,090	26,850,218	3,352,429	17,211,612	19,688,108	3,217,521	5,626,143	8,667,870
1893	21,371,555	29,836,986	17,964,667	28,347,896	4,049,173	19,538,444	21,064,180	4,688,799	6,705,798	12,358,999
1894	12,163,481	16,234,182	15,162,333	16,786,152	2,641,205	14,534,859	6,107,438	3,003,888	6,010,492	2,640,770
1895	13,282,081	22,626,056	18,475,382	26,122,942	3,320,058	15,364,997	25,556,421	4,714,375	7,374,205	6,787,424
1896	12,870,694	26,763,428	16,781,533	30,520,177	3,545,700	17,794,259	32,451,242	6,578,212	8,439,156	6,761,716
1897	12,336,418	18,918,283	17,558,163	27,863,026	2,938,979	16,314,041	53,243,191	5,884,202	8,519,928	6,535,852
1898	13,446,186	32,110,066	25,545,391	37,068,932	3,832,603	16,166,245	16,783,692	5,019,503	6,434,091	8,776,151
1899	20,300,093	32,479,627	32,041,626	41,988,043	5,645,731	17,294,784	8,822,897	5,013,146	5,849,912	11,843,357
1900	26,373,805	45,329,760	31,792,697	57,935,698	6,646,807	20,452,489	20,260,936	7,900,945	5,961,456	19,104,301
1901	22,932,500	30,051,365	28,835,178	48,220,013	6,238,842	20,256,257	12,529,881	6,787,828	6,950,123	19,805,551
1902	31,545,962	42,635,351	25,652,977	58,011,168	9,787,013	22,216,861	17,711,788	12,208,231	7,587,901	19,461,850
1903	34,462,513	50,011,050	31,004,541	58,031,613	8,815,108	25,496,483	22,152,961	11,698,653	8,294,963	23,618,802
1904	37,814,285	46,100,500	41,049,434	52,006,070	9,005,873	25,688,083	24,813,591	9,387,331	8,429,218	21,486,311
1905	38,118,071	61,040,053	50,729,873	64,764,146	10,502,907	23,877,238	46,225,558	10,650,624	7,880,746	23,378,471
1906	39,360,290	54,080,504	46,188,374	83,882,167	13,116,716	28,882,157	39,068,372	12,235,634	8,931,114	30,932,998
1907	42,239,358	71,411,899	60,511,459	83,206,545	12,911,434	29,108,453	41,534,028	20,973,255	11,471,595	38,117,459
1908	35,493,083	64,546,903	38,030,022	54,770,136	9,580,323	24,306,604	23,664,938	14,617,734	12,500,487	25,295,061
1909	29,748,353	79,903,586	63,167,103	78,487,324	11,653,586	23,833,946	45,171,994	13,622,862	11,455,143	26,007,216
1910	32,418,839	67,129,603	103,862,799	112,247,836	15,589,258	24,609,326	51,220,844	15,816,138	15,176,506	30,869,532
1911	30,752,250	74,998,265	90,575,643	70,504,980	15,351,001	23,122,846	28,228,005	24,776,320	14,475,198	37,935,978
1912	34,402,866	69,541,672	102,941,901	102,476,327	17,339,198	22,422,599	33,078,342	20,217,581	14,271,416	26,214,198

COMPARISON OF SPEED.

	In one sec.		In one sec.		In one sec.
Snail	1½ in.	Ocean-steamer	11 yds.	Swallow	50 yds.
Pedestrian	3 ft.	Skater	13 "	Sound	360 "
Horse walking	4 "	Luggage train	13 "	Breech loading rifle	470 "
Pedestrian walking quickly	6⅔ "	Storm	19 "	Cannon ball	490 "
Horse trotting	11½ "	Parliamentary train	20 "	Revolution of the earth on its axis at the equator	490 "
Gentle breeze	13 "	Carrier pigeon	20 "	Revolution of the earth around the sun	19 mi.
Horse galloping	15 "	Velocipede (racing)	22 "	Light	186,000 "
River-steamer	16 "	Horse (racing)	27 "	Electricity	250,000 "
Sailing boat	9 yds.	Express train	28 "		



The Ambrose Channel is one-third the size of the Panama Canal; it has been excavated with one hundred and fifteenth of the number of men; it is now accommodating more shipping than will the Panama Canal in many years to come.

THE AMBROSE CHANNEL AS MEASURED BY THE PANAMA CANAL.

MILESTONES OF MARITIME PROGRESS.

1833—Sails to wooden paddles.
1843—Wood to iron hulls.
1850—Paddles to screw-propellers.
1856—Simple to compound engines.
1879—Iron to steel hulls.
1889—Simple to twin-screw.
1906—Triple-expansion to turbine engines.
1907—Quadruple-screw propellers.

Imports and Domestic Exports of Merchandise, by Principal Articles and Classes, Years Ending June 30, 1906–1912.

EXPORTS.

Order of magnitude, 1911.	ARTICLES.	1912 Value.	1912 Per cent of total.
		Dollars.	
1	Cotton, unmanufactured	565,849,271	26.07
2	Iron and steel, manufactures of	268,154,262	12.36
3	Meat and dairy products	156,260,876	7.20
4	Breadstuffs	123,979,715	5.71
5	Copper, and manufactures of	117,082,784	5.39
6	Mineral oils	112,472,100	5.18
7	Wood, and manufactures of	96,782,186	4.46
8	Leather, and manufactures of	60,756,772	2.80
9	Coal	52,648,750	2.43
10	Cotton, manufactures of	50,769,511	2.34
11	Tobacco, and manufactures of	48,305,042	2.23
12	Cars, carriages, etc	42,633,303	1.96
13	Agricultural implements	35,640,005	1.64
14	Fruits and nuts	30,963,638	1.43
15	Oil cake and oil-cake meal	28,228,705	1.30
16	Vegetable oil	26,908,931	1.24
17	Naval stores	26,754,987	1.23
18	Chemicals, drugs, dyes, and medicines	25,117,217	1.16
19	Paper, and manufactures of	19,458,050	.90
20	Animals	15,447,987	.71
21	Furs and fur skins	14,975,449	.69
22	Instruments for scientific purposes	13,526,802	.62
23	India rubber, and manufactures of	12,822,918	.59
24	Fertilizers	10,873,908	.50
25	Fibers, vegetable, etc., manufactures of	9,898,528	.46
26	Photographic goods	9,445,446	.44
27	Brass, and manufactures of	8,880,942	.41
28	Nickel, nickel oxide, and matte	8,749,675	.40
29	Fish	8,640,938	.39
30	Sugar, molasses, and confectionery	8,250,907	0.38
31	Household and personal effects	8,230,470	.38
32	Paraffin and paraffin wax	8,123,486	.37
33	Paints, pigments, colors, and varnishes	7,072,617	.33
34	Coffee, green	6,864,068	.32
35	Grease, grease scraps, etc	6,679,092	.31
36	Vegetables	6,544,118	.30
37	Explosives	5,050,858	.23
38	Soap	4,536,028	.21
39	Coke	2,938,191	.14
40	Seeds	2,898,802	.13
	All other articles	101,101,293	4.66
	Total	170,319,828	100.00

IMPORTS.

Order of magnitude, 1912.	ARTICLES	1912 Value.	1912 Per cent of total.
		Dollars.	
1	Coffee	117,826,543	7.13
2	Sugar	115,515,079	6.99
3	India rubber and gutta-percha, crude	102,941,901	6.23
4	Hides and skins, other than fur skins	102,476,327	6.20
5	Chemicals, drugs, and dyes	92,029,625	5.56
6	Silk, unmanufactured	69,541,672	4.21
7	Cotton, manufactures of	65,152,785	3.94
8	Fibers, vegetable, etc., manufactures of	59,659,843	3.61
9	Wood, and manufactures of	52,502,131	3.18
10	Tin in bars, blocks, pigs, etc	46,214,198	2.80
11	Fruits and nuts	45,377,269	2.74
12	Diamonds and other precious stones	41,297,759	2.50
13	Tobacco, and manufactures of	37,380,376	2.26
14	Art works	36,092,595	2.18
15	Copper, manufactures of	35,843,537	2.17
16	Fibers, vegetable, etc., unmanufactured	34,462,866	2.08
17	Wool, unmanufactured	33,078,342	2.00
18	Oils	31,348,602	1.90
19	Silk, manufactures of	27,204,364	1.65
20	Iron and steel, and manufactures of	26,676,956	1.61
21	Furs, and manufactures of	25,872,227	1.56
22	Seeds	25,641,172	1.55
23	Cotton, unmanufactured	20,217,581	1.22
24	Spirits, wines, and malt liquors	19,334,605	1.17
25	Vegetables	18,544,873	1.12
26	Breadstuffs	18,529,764	1.12
27	Articles, the growth, etc., of the United States, returned	18,501,232	1.12
28	Tea	18,207,141	1.10
29	Paper, and manufactures of	17,300,349	1.05
30	Leather, and manufactures of	16,166,706	.98
31	Cocoa, or cacao, crude, and shells of	15,931,556	.96
32	Wool, manufactures of	14,912,619	.90
33	Fish	14,553,347	.88
34	Meat and dairy products	13,774,560	.83
35	Fertilizers	10,046,728	.61
36	Earthen, stone, and china ware	9,997,698	.60
37	Hats, bonnets, and hoods, and materials for	9,686,464	.59
38	Copper ore, matte, and regulus	9,363,182	.57
39	Animals	7,580,555	.46
40	Metals, metal compositions, and manufactures of, n. e. s.	5,968,067	.36
	All other articles	170,563,688	10.31
	Total	1,653,264,934	100.00

PRINCIPAL PORTS OF THE WORLD: Foreign Commerce During the Latest Year for which Data are Available.

[Sources: Official reports of the respective countries.]

Country and port.	Year.[1]	Imports.	Exports.	Total commerce.
EUROPE.				
United Kingdom:		*Dollars.*	*Dollars.*	*Dollars.*
London[2]	1911	1,119,238,957	672,618,684	1,791,857,641
Liverpool	1911	778,229,287	859,051,189	1,637,280,476
Hull	1911	199,926,677	147,799,722	347,726,399
Manchester[3]	1911	158,175,626	105,313,585	263,489,211
Southampton	1911	101,052,736	128,728,445	229,781,181
Glasgow	1911	76,068,987	153,318,323	229,387,310
Harwich	1911	109,192,590	38,221,199	147,413,789
Grimsby	1911	65,912,484	98,540,279	164,452,763
Leith	1911	73,261,366	35,393,539	108,654,906
Tyne ports[4]	1911	47,616,717	50,083,799	97,700,516
Cardiff	1911	29,280,621	61,648,009	90,928,630
Bristol	1911	75,710,603	19,548,419	95,259,022
Belfast	1911	39,620,551	6,250,986	45,871,537
Germany:				
Hamburg	1911	962,925,352	711,261.824	1,674,187,176
Bremen	1911	323,090,469	178,056,071	501,146,540
Belgium: Antwerp	1911	594,472,069	527,182,730	1,121,654,799
France:				
Marseille	1911	363,669,100	314,762,200	678,431,300
Havre	1911	316,944,400	214,152,200	531,096,600
Dunkirk	1911	182,808,600	30,280,200	213,088,800
Bordeaux	1911	95,918,900	92,404,200	188,323,100
Italy: Genoa	1910	174,837,600	86,249,414	261,087,014
Austria-Hungary:				
Trieste	1911	141,795,166	124 710,102	266,505,268
Fiume	1910	25,387,000	28,439,500	53,826,500
Russia:				
St. Petersburg	1910	77,154,500	58,783,218	135,937,718
Riga	1910	46,575,482	91,715,878	138,291,360
Odessa	1910	28,562,305	41,390,953	69,953,258
Reval	1910	34,086,511	12,899,359	46,985,870
Novorossisk	1910	5,684,472	35,522,800	41,207,272
Vladivostok	1910	24,664,556	896,292	25,560,848
Spain:				
Barcelona	1910	57,688,833	26,774,964	84,463,797
Bilbao	1910	15,561,498	10,901,903	26,463,401
AMERICA.				
United States:[5]				
New York	1912	975,744,320	817,945,803	1,793,690,123
New Orleans	1912	75,089,887	149,160,910	224,250,797
Galveston	1912	4,309,758	218,146,097	222,455,855
Boston[6]	1912	129,293,016	69,692,171	198.985.187
Philadelphia	1912	85,038,185	69,069,730	154,107.915
Baltimore	1912	26,438,400	92,210,877	118,649.277
San Francisco	1912	59,235,471	49,249,734	108,485,205
Savannah	1912	5,129,979	104,286,925	109,416,904
Puget Sound	1912	39,011,250	63,745,572	102,756.822
Canada: Montreal[7]	1912	138,291,851	74,944,869	213,236,720
Mexico:[5]				
Tampico	1912	19,037,493	46.192,692	65,230,185
Vera Cruz	1912	36,309,552	43.614,581	79,924,133
Cuba: Habana[5]	1911	71,219,293	43.996.135	115,215,428
Argentina: Buenos Aires	1912	304,131,043	175,405,198	479,536,241
Brazil:				
Santos	1911	64,353.972	160.589.521	224.943,493
Rio Janeiro	1910	87,257,063	38,068,876	125,325,939
Chile:				
Valparaiso	1911	59,377,274	5,547,320	64,924.594
Iquique	1911	10,209,782	23,669.957	33,879,739
Uruguay: Montevideo	1911	43,587,073	31,430,794	75,017,867

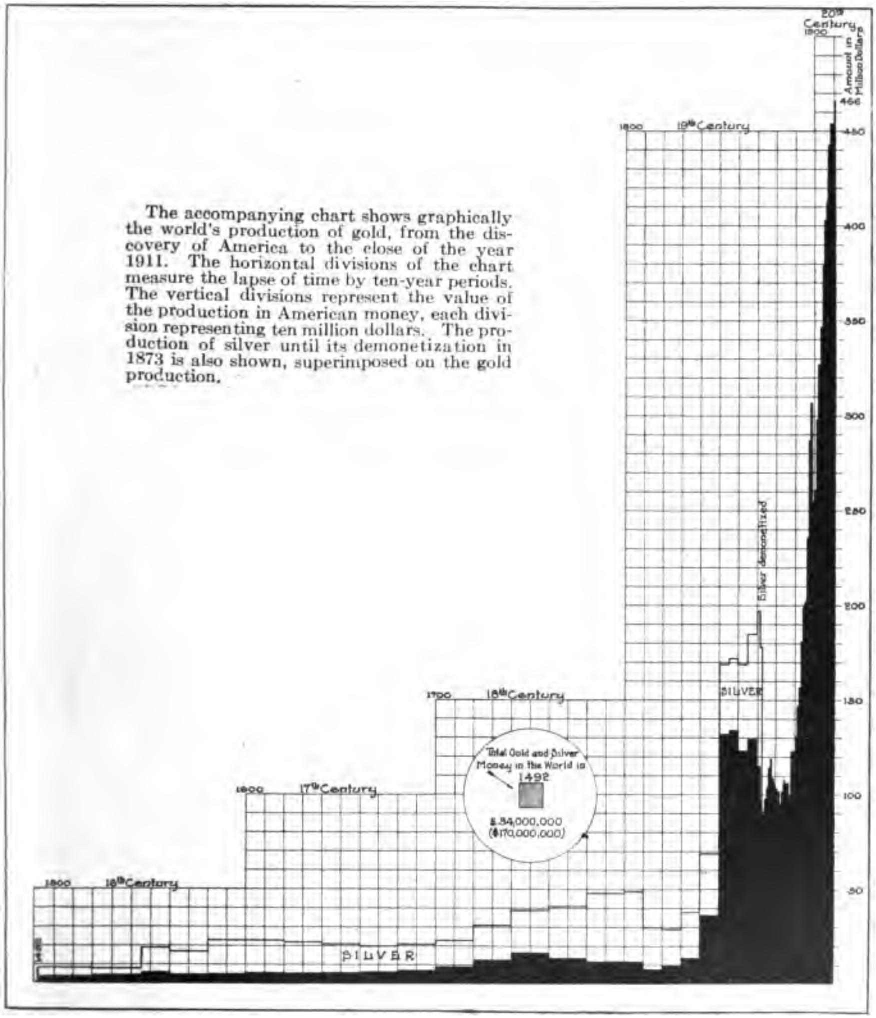
[1] Calendar years unless otherwise specified by note.
[2] Including Queenborough.
[3] Including Runcorn.
[4] Tyne ports comprise Newcastle, North Shields, and South Shields.
[5] Years ended June 30.
[6] Including Charlestown.
[7] Years ended Mar. 31.

PRINCIPAL PORTS OF THE WORLD: Vessel Tonnage Movement in the Foreign Trade, during the Latest Year for which Data are Available.

[Sources: Official reports of the respective countries.]

Country and port.	Year.[1]	Entered.	Cleared.
EUROPE.			
Great Britain:		*Net tons.*	*Net tons.*
Cardiff	1911	5,526,426	8,328,047
Hull	1911	3,534,964	3,185,290
Liverpool	1911	7,887,719	6,880,271
London	1911	11,973,249	9,004,974
Tyne ports	1911	5,954,498	6,842,199
Glasgow	1911	2,146,512	3,418,771
Malta-Valetta[2]	1912	4,119,221	4,121,599
Gibraltar	1911	5,903,529	5,800,634
Germany:			
Hamburg	1911	11,830,949	11,945,239
Bremen	1911	1,485,487	1,437,371
Bremerhaven	1911	1,696,538	1,608,388
Denmark: Copenhagen	1910	3,135,006	3,239,021
France:			
Havre	1910	4,028,057	4,138,172
Cherbourg	1910	4,034,061	4,031,007
Bordeaux	1910	2,062,188	2,194,755
Boulogne	1910	2,523,146	2,510,454
Marseille	1910	8,161,344	8,186,315
Austria: Trieste	1911	2,031,995	2,021,034
Belgium: Antwerp	1911	13,330,699	13,325,781
Netherlands: Rotterdam	1911	11,052,186	10,800,490
Italy:			
Genoa	1910	4,562,082	4,025,097
Naples	1910	3,303,898	3,296,836
Greece: Piræus	1910	3,778,371	3,776,056
Portugal: Lisbon	1910	4,739,383	4,635,966
Russia:			
Cronstadt-St. Petersburg	1910	1,897,517	1,894,816
Odessa	1910	1,413,157	1,354,952
Riga	1910	1,683,826	1,744,846
Taganrog	1910	1,189,742	1,190,894
Vladivostok	1910	895,417	826,250
Spain:			
Barcelona	1910	2,464,111	1,645,045
Bilbao (Vizcaya)	1910	2,148,286	1,609,378
Turkey: Constantinople	1912	[3] 20,171,065	
AMERICA.			
United States:[4]			
New York	1912	13,673,765	13,549,138
Boston and Charlestown	1912	2,948,244	1,872,493
Philadelphia	1912	2,700,193	2,187,408
Baltimore	1912	1,192,037	1,489,406
Galveston	1912	1,025,257	1,349,347
New Orleans	1912	2,214,681	2,360,043
AMERICA—contd.			
United States—Continued.		*Net tons.*	*Net tons.*
Puget Sound	1912	2,498,150	2,857,818
San Francisco	1912	928,289	1,154,942
Canada:[2]			
Montreal	1912	1,702,690	1,683,261
Vancouver	1912	1,884,846	1,874,263
Victoria	1912	1,874,102	1,748,749
Mexico:[4,5]			
Vera Cruz	1911	925,086	788,024
Tampico	1911	551,698	762,195
Argentina: Buenos Aires	1908	5,981,477	5,079,863
Brazil:			
Santos	1911	3,440,880	3,310,414
Rio de Janeiro	1911	4,541,820	3,696,907
Cuba: Habana[4]	1911	3,117,313	3,121,372
ASIA.			
British India:[2]			
Bombay	1911	1,829,997	1,652,871
Calcutta	1911	2,059,652	1,741,638
British Colonies:			
Hongkong-Victoria[6]	1911	10,246,622	10,243,898
Singapore[7]	1911	7,737,785	7,717,691
Colombo[8]	1911	7,074,152	7,073,170
Aden[2,9]	1912	3,594,888	3,592,154
China: Shanghai[10]	1911	9,170,309	9,429,996
Japan:			
Yokohama	1911	3,645,162	3,448,773
Nagasaki	1911	2,418,310	2,382,144
Kobe	1911	5,640,946	5,539,847
Moji	1911	4,036,431	4,113,479
AFRICA.			
Egypt: Alexandria	1911	3,443,705	3,414,966
Union of South Africa:			
Cape Town	1911	2,195,902	1,952,023
Port Natal	1911	3,078,745	3,133,359
OCEANIA.			
Australia:[11]			
Melbourne	1911	550,259	372,216
Sydney	1911	991,706	944,972
Fremantle	1911	802,860	607,842
Adelaide	1911	581,385	433,289

[1] Calendar years unless otherwise specified by note.
[2] Year ended Mar. 31.
[3] Total movement of shipping, excluding sailing and small coasting vessels. Separate data for entrances and clearances not available. Year ended Feb. 28.
[4] Year ended June 30.
[5] Gross tons.
[6] Excluding Chinese junks engaged in the foreign trade.



The accompanying chart shows graphically the world's production of gold, from the discovery of America to the close of the year 1911. The horizontal divisions of the chart measure the lapse of time by ten-year periods. The vertical divisions represent the value of the production in American money, each division representing ten million dollars. The production of silver until its demonetization in 1873 is also shown, superimposed on the gold production.

THE WORLD'S PRODUCTION OF GOLD AND SILVER.

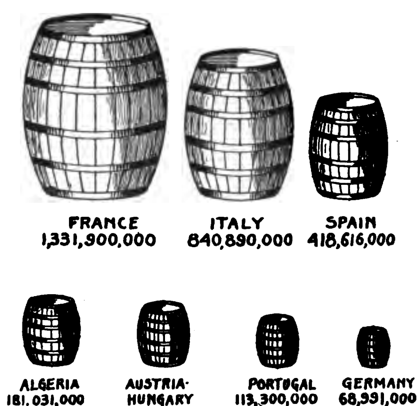
NOTES TO PRECEDING PAGE—Continued.

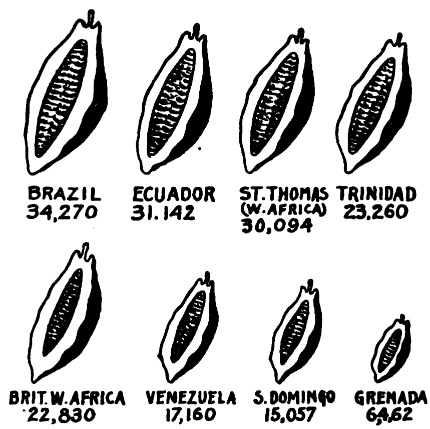
[7] **Excluding warships, transports, yachts, native craft and steam and sailing vessels under 50 tons, but including vessels engaged in intersettlement trade.**
[8] **Excluding the tonnage of vessels that called for the purpose of coaling and for orders only.**
[9] **Including native craft.**
[10] **Tonnage of vessels entered and cleared at the maritime customs.**
[11] **Figures of direct entrances and clearances from and to places outside the Commonwealth.**

PRINCIPAL PORTS OF THE WORLD: FOREIGN COMMERCE DURING THE LATEST YEAR FOR WHICH DATA ARE AVAILABLE—Continued.

Country and port.	Year.	Imports.	Exports.	Total commerce.
ASIA.		*Dollars.*	*Dollars.*	*Dollars.*
China: Shanghai [1]	1911	137,571,828	104,414,266	241,986,094
Japan:				
Yokohama	1911	87,439,734	112,673,238	200,112,972
Kobe	1911	127,605,203	59,288,935	186,894,138
British Colonies:				
Singapore [2]	1911	148,556,452	120,944,052	269,500,504
Calcutta [3, 4]	1911	157,482,211	252,646,619	410,128,830
Bombay [3, 4]	1911	153,590,789	204,509,066	358,099,855
AFRICA.				
Egypt: Alexandria	1911	107,698,158	138,477,779	146,175,937
OCEANIA.				
Australia: [5]				
Sydney	1911	128,352,288	149,380,512	277,732,800
Melbourne	1911	104,682,907	87,158,450	191,841,357

[1] Direct foreign trade, exclusive of reexports.
[2] Exclusive of intersettlement trade.
[3] Years ended Mar. 31.
[4] Merchandise only, exclusive of Government stores.
[5] Exclusive of interstate commerce.





WINE.
(in gallons.)

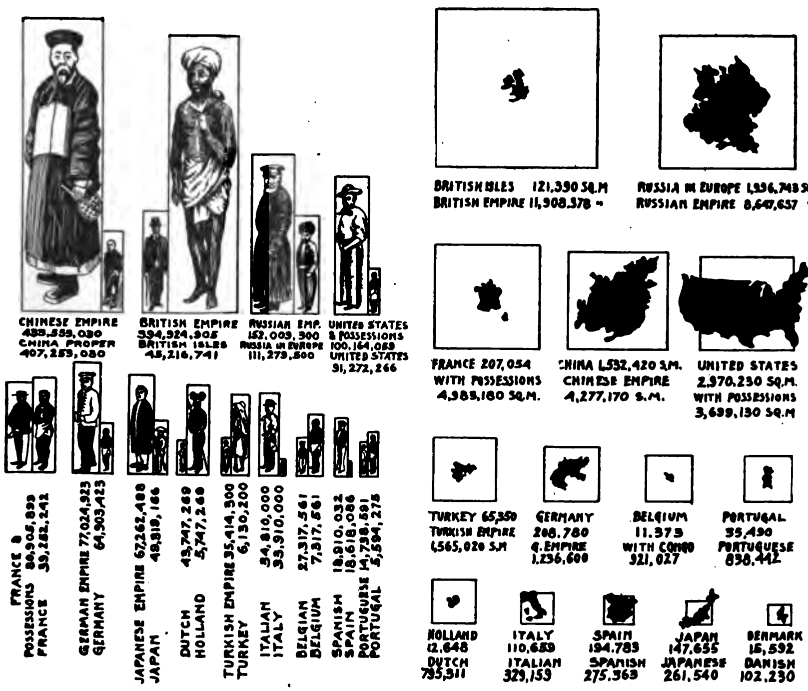
COCOA.
(in tons.)

ONE YEAR'S PRODUCTION.

GOLD: Values of Imports and Exports and Annual Excess of Imports or Exports, 1862 to 1912.[1]

Year ended June 30—	Exports.			Imports.	Excess of—	
	Domestic.[2]	Foreign.	Total.		Exports over imports.	Imports over exports.
	Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
1862....	31,044,651	4,395,252	....	13,907,011	....	....
1870....	28,580,609	5,055,353	33,635,962	12,056,950	21,579,012	....
1880....	1,775,039	1,863,986	3,639,025	80,758,396	....	77,119,371
1890....	13,403,632	3,870,859	17,274,491	12,943,342	4,331,149	....
1900....	46,693,893	1,572,866	48,266,759	44,573,184	3,693,575	....
1910....	114,569,714	3,993,501	118,563,215	43,339,905	75,223,310	....
1911....	21,810,820	698,833	22,509,653	73,607,013	....	51,097,360
1912....	53,495,479	3,832,869	57,328,348	48,936,500	8,391,848	....

[1]The figures relate to coin and bullion only prior to 1895; subsequently they include ore also.
[2]Gold and silver cannot be separately stated in domestic exports prior to 1864, but it is probable that the greater portion of the exports was gold, under which head the silver in question is included.



HOME AND COLONIAL POPULATIONS AND AREAS OF THE WORLD'S EMPIRES.

SILVER: VALUES OF IMPORTS AND EXPORTS AND ANNUAL EXCESS EXPORTS OVER IMPORTS, 1862 TO 1912.[1]

Year ended June 30—	Exports.			Imports.	Excess of exports over imports.
	Domestic.[2]	Foreign.	Total.		
	Dollars.	*Dollars.*	*Dollars.*	*Dollars.*	*Dollars.*
1862	....	1,447,737	....	2,508,041	....
1870	15,303,193	9,216,511	24,519,704	14,362,229	10,157,475
1880	7,572,854	5,931,040	13,503,894	12,257,914	1,227,980
1890	22,378,557	12,495,372	34,873,929	21,032,984	13,840,945
1900	52,464,345	4,247,930	56,712,275	35,256,302	21.455,973
1910	53,094,567	2,192,294	55,286,861	45,217,194	10,069,667
1911	60,068,925	4,681,033	64,749,958	45,937,249	18,812,709
1912	58,522,368	6,368,297	64,890,665	47,050,219	17,840,446

[1]The figures relate to coin and bullion only prior to 1895; subsequently they include ore also.
[2]Gold and silver can not be separately stated in domestic exports prior to 1864, but it is probable that the greater portion of the exports was gold, under which head the silver in question is included.

THE PROGRESS OF ANTARCTIC EXPLORATION.

FAILURES IN THE UNITED STATES.

MANUFACTURERS.	Number 1911.	Number 1912.	Liabilities 1911.	Liabilities 1912.
Iron, Foundries and Nails	61	80	$5,056,635	$6,995,098
Machinery and Tools	173	233	6,689,566	9,960,268
Woolens, Carpets and Knit Goods	53	35	4,329,758	1,690,099
Cottons, Lace and Hosiery	36	33	3,590,816	1,057,689
Lumber, Carpenters and Coopers	416	421	16,000,205	12,971,002
Clothing and Millinery	497	647	4,509,586	8,375,053
Hats, Gloves and Furs	68	98	978,002	2,025,258
Chemicals and Drugs	15	37	105,623	625,684
Paints and Oils	26	13	1,051,212	286,158
Printing and Engraving	172	173	2,448,366	1,788,198
Milling and Bakers	218	292	1,264,511	1,578,773
Leather, Shoes and Harness	79	113	1,577,919	2,779,922
Liquors and Tobacco	105	115	2,451,589	3,224,162
Glass, Earthenware and Bricks	127	121	3,972,382	6,531,565
All Other	1,455	1,428	33,345,453	26,830,903
Total Manufacturing	3,502	3,839	$87,371,623	$86,719,832
TRADERS.				
General Stores	1,380	1,777	$10,977,030	$12,760,623
Groceries, Meat and Fish	2,134	2,597	9,543,008	13,162,922
Hotels and Restaurants	486	501	3,762,792	5,399,706
Liquors and Tobacco	747	819	4,268,965	5,234,609
Clothing and Furnishings	1,036	1,121	10,015,849	9,790,491
Dry Goods and Carpets	671	786	11,320,606	9,443,253
Shoes, Rubbers and Trunks	349	411	2,461,699	3,330,470
Furniture and Crockery	287	316	2,877,533	2,535,861
Hardware, Stoves and Tools	302	287	3,401,792	3,459,410
Chemicals and Drugs	361	430	1,943,546	2,664,716
Paints and Oils	57	62	438,667	386,435
Jewelry and Clocks	296	385	3,270,182	4,080,816
Books and Papers	90	99	951,147	865,880
Hats, Furs and Gloves	62	75	886,204	693,260
All Other	1,222	1,345	18,117,659	17,971,513
Total Trading	9,480	11,011	$84,239,679	$91,779,965
Brokers and Transporters	459	602	19,450,363	24,617,594
Total Commercial	13,441	15,452	$191,061,665	$203,117,391
Banking	107	79	25,511,606	24,219,522

Year.	No.	Liabilities.	Year.	No.	Liabilities.	Year.	No.	Liabilities.
1870	3,546	$88,242,000	1885	10,637	124,220,321	1900	10,774	$138,495,673
1871	2,915	85,252,000	1886	9,834	114,644,119	1901	11,002	113,092,376
1872	4,069	121,056,000	1887	9,634	167,560,944	1902	11,615	117,476,769
1873	5,183	228,499,900	1888	10,679	123,829,973	1903	12,069	155,444,185
1874	5,830	155,239,000	1889	10,882	148,784,337	1904	12,199	144,202,311
1875	7,740	201,000,000	1890	10,907	189,856,964	1905	11,520	102,676,172
1876	9,092	191,117,000	1891	12,273	189,868,638	1906	10,682	119,201,515
1877	8,872	190,669,936	1892	10,344	114,044,167	1907	11,725	197,385,225
1878	10,478	234,383,132	1893	15,242	346,779,889	1908	15,690	222,315,684
1879	6,658	98,149,053	1894	13,885	172,992,856	1909	15,924	154,603,465
1880	4,735	65,752,000	1895	13,197	173,196,060	1910	12,652	201,757,097
1881	5,582	81,155,932	1896	15,088	226,096,834	1911	13,441	191,061,665
1882	6,738	101,547,564	1897	13,351	154,332,071	1912	15,452	203,117,391
1883	9,184	172,874,172	1898	12,186	130,662,899			
1884	10,968	226,343,427	1899	9,337	90,879,889			

Courtesy of Dun's Review.

COINAGE OF THE UNITED STATES MINTS.

The total coinage of gold in the United States mints for the year ending December 31, 1912 was $17,498,522.50; the total coinage of silver for the same period amounted to $7,340,995.00 and the total coinage of minor metals to $2,577,386.30. Thus the total coinage of the United States Mints amounted to $27,416,903.80.

PRICES OF THE LEADING ARTICLES OF GRAIN, GROCERIES AND PROVISIONS IN NEW YORK MARKET.

[Sources: Coffee, Mr. Louis Seligsberg, New York; Sugar, Messrs. Willett & Gray; other figures, Mr. Henry Heinzer, statistician, New York Produce Exchange.]

Calendar year.	Wheat, No. 2, red winter, per bushel.	Corn, No. 2, mixed, per bushel.	Oats, No. 2, mixed, per bushel.	Lard, prime contract, per pound.	Beef, extra mess, per barrel.	Pork, mess, per barrel.	Tallow, prime, per pound.	Coffee. Brazil, fair to prime, per pound.[1]	Coffee. No. 7, Exchange standard, per pound.	Coffee. Java, per pound.	Sugar. Raw, centrifugals, per pound.	Sugar. Soft, standard A, per pound.	Sugar. Hard, granulated, per pound.
	Dolls.	*Cents.*	*Cents.*	*Cents.*	*Dolls.*	*Dolls.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1891	1.094	70.4	46.0	6.59	8.35	11.38	4.81	17.80	16.40	24.50	3.92	4.47	4.65
1892	.908	54.0	36.8	7.69	6.86	11.52	4.62	15.88	14.43	26.37	3.32	4.21	4.35
1893	.739	49.9	35.9	10.34	8.17	18.35	5.44	18.82	17.42	24.23	3.69	4.72	4.84
1894	.611	50.9	37.2	7.75	8.16	14.13	4.81	17.81	16.41	23.25	3.24	4.00	4.12
1895	.669	47.7	28.9	6.50	8.09	11.91	4.33	17.80	15.80	26.60	3.23	4.00	4.12
1896	.781	34.0	23.3	4.67	7.51	8.95	3.44	15.05	12.15	23.44	3.62	4.41	4.53
1897	.954	31.9	23.2	4.42	7.71	8.85	3.31	11.96	9.80	24.00	3.56	4.38	4.50
1898	.952	37.6	29.7	5.53	9.16	9.82	3.56	8.00	6.80	24.00	4.24	4.84	4.97
1899	.794	41.3	30.7	5.57	9.26	9.35	4.54	7.45	6.25	24.00	4.42	4.80	4.92
1900	.804	45.3	27.8	7.05	9.73	12.48	4.84	9.50	8.30	22.00	4.57	5.12	5.32
1901	.803	56.7	36.6	8.87	9.32	15.62	5.25	8.60	7.38	17.00	4.05	4.85	5.05
1902	.836	68.4	44.9	10.59	11.75	17.94	6.31	6.75	5.65	16.00	3.54	4.27	4.46
1903	.853	57.2	41.1	8.81	9.03	16.50	5.06	6.75	5.50	15.75	3.72	4.48	4.64
1904	1.107	59.4	42.0	7.82	8.82	14.01	4.60	8.80	7.70	15.00	3.97	4.62	4.77
1905	1.028	59.3	35.0	7.44	10.02	14.48	4.50	9.15	8.25	15.00	4.28	5.11	5.26
1906	.865	56.0	33.0	8.68	8.85	17.55	5.31	9.25	8.10	14.50	3.69	4.37	4.52
1907	.963	64.0	49.6	9.20	9.83	17.61	6.25	8.85	6.60	16.50	3.76	4.45	4.65
1908	1.04¼	78.6	54.5	9.08	13.20	15.98	5.50	7.85	6.25	18.50	4.07	4.76	4.96
1909	1.263	76.7	51.4	11.68	11.09	21.34	6.00	8.75	7.85	18.00	4.00	4.56	4.76
1910	1.118	66.8	....	12.52	14.64	23.72	7.25	10.15	9.60	18.00	4.19	4.77	4.97
1911	.963	71.1	[2] 45.7	9.11	12.92	19.12	6.50	14.85	13.25	18.75	4.453	5.145	5.345
1912	1.091	([3])	56.4	10.51	15.80	19.83	6.13	15.60	14.45	18.75	4.162	4.891	5.041

[1] No. 3, Exchange standard. [2] No. 2 white oats. [3] Nominal.

ESTIMATED STOCK OF GOLD AND SILVER IN THE UNITED STATES.

At the end of the fiscal year June 30, 1912, the population of the United States was 95,656,000, against 76,891,000 in 1900, 62,622,250 in 1890, 50,155,783 in 1880, and 41,677,000 in 1873. The total stock of gold coin and bullion in 1912 was $1,812,856,241 against $1,034,439,264 in 1900, $695,563,029 in 1890, $351,841,206 in 1880, and $135,000,000 in 1873. The total stock of silver coin and bullion in 1912 amounted to $741,184,095 against $647,371,030 in 1900, $463,211,919 in 1890, $148,522,678 in 1880, and $6,149,305 in 1873. The amount of gold per capita in the United States at the end of the fiscal year June 30, 1912, was $18.95, against $13.45 in 1900, $11.10 in 1890, $7.01 in 1880, and $3.23 in 1873. At the end of this same period the supply of silver per capita was $7.75, against $8.42 in 1900, $7.39 in 1890, $2.96 in 1880, and $0.15 in 1873.

RESOURCES AND LIABILITIES OF NATIONAL BANKS IN 1912.

The resources of the 7,397 National Banks in the United States on September 4, 1912, which amounted to a grand total of 10,963.4 million dollars, were derived from the following sources: Loans and discounts, including overdrafts, 6,061.0 million dollars; bonds for circulation 724.0 millions; other United States bonds and other bonds for deposits 78.7 millions; bonds, securities, etc., 1,039.9 millions; due from banks and reserve agents 1,453.0 millions; real estate, banking house, etc., 268.5 millions; specie, 713.4 millions; legal-tender notes 182.5 millions; bills of other banks, 48.5 millions; clearing-house exchanges 296.0 millions; due from United States Treasurer 41.9 millions; other resources 56.0 millions.

Their liabilities for the same period, totaling 10,963.4 million dollars, were as follows: Capital stock 1,046.0 millions; surplus fund 701.0 millions; undivided profits 242.7 millions; national bank circulation 713.8 millions; individual deposits 5,891.6 millions; due to banks and reserve agents 2,177.4 millions; other liabilities 190.0 millions.

RELATIVE PRICES OF COMMODITIES, 1890 TO 1911, BY GROUPS

Relative Price in 1890 to 1899—100

Year or Month	Farm Products	Food, etc.	Cloths and Clothing	Fuel and Lighting	Metals and Implements	Lumber and Building Material	House Furnishing Goods	Miscellaneous
1890..........	110.0	112.4	113.5	104.7	119.2	111.0	111.1	110.3
1891..........	121.5	115.7	111.3	102.7	111.7	108.4	110.2	109.4
1892..........	111.7	103.6	109.0	101.1	106.0	102.8	106.5	106.2
1893..........	107.9	110.2	107.2	100.0	100.7	101.9	104.9	105.9
1894..........	95.9	90.8	96.1	92.4	90.7	96.3	100.1	99.8
1895..........	93.3	94.6	92.7	98.1	92.0	94.1	96.5	94.5
1896..........	78.3	83.8	91.3	104.3	93.7	93.4	94.0	91.4
1897..........	85.2	87.7	91.1	96.4	86.6	90.4	89.8	92.1
1898..........	96.1	94.4	93.4	95.4	86.4	95.8	92.0	92.4
1899..........	100.0	98.3	96.7	105.0	114.7	105.8	95.1	97.7
1900..........	109.5	104.2	106.8	120.9	120.5	115.7	106.1	109.8
1901..........	116.9	105.9	101.0	119.5	111.9	116.7	110.9	107.4
1902..........	130.5	111.3	102.0	134.3	117.2	118.8	112.2	114.1
1903..........	118.8	107.1	106.6	149.3	117.6	121.4	113.0	113.6
1904..........	126.2	107.2	109.8	132.6	109.6	122.7	111.7	111.7
1905..........	124.2	108.7	112.0	128.8	122.5	127.7	109.1	112.8
1906..........	123.6	112.6	120.0	131.9	135.2	140.1	111.0	121.1
1907..........	137.1	117.8	126.7	135.0	143.4	146.9	118.5	127.1
1908..........	133.1	120.6	116.9	130.8	125.4	133.1	114.0	119.9
1909..........	153.1	124.7	119.6	129.3	124.8	138.4	111.7	125.9
1910..........	164.6	128.7	123.7	125.4	128.5	153.2	111.6	133.1
1911..........	162.0	131.3	119.6	122.4	119.4	151.9	111.1	131.2

CASUALTY AND SURETY INSURANCE BUSINESS IN 1911.

The business of Companies doing a miscellaneous insurance business in the United States during the year 1911 was divided as follows: Automobile business, $2,676,767 received from premiums, $1,129,193 paid for losses; burglary, $2,850,344 received from premiums, $1,110,978 paid for losses; credit, $1,752,582 received from premiums, $1,056,-133 paid for losses; fidelity and surety, $16,958,051 received from premiums, $4,980,-430 paid for losses; health, $7,101,666 received from premiums, $3,314,301 paid for losses; liability, $35,201,753 received from premiums, $20,341,029 paid for losses; personal accident, $27,351,626 received from premiums, $11,837,347 paid for losses; plate glass, $3,960,546 received from premiums, $1,714,236 paid for losses; steam boiler, $2,246,225 received from premiums, $282,338 paid for losses; sprinkler business, $178,016 received from premiums, $73,438 paid for losses; flywheel, $184,514 received from premiums, $75,704 paid for losses; live stock, $572,564 received from premiums, $267,315 paid for losses; workmen's collective, $711,726 received from premiums, $306,433 paid for losses. Courtesy Spectator Ins. Year Book.

The first fire insurance company in the United States was established in Boston, Mass. by the Sun Insurance Company (English) in 1728. The first fire insurance policy was issued in Hartford, Conn., 1794. First accident insurance company established at Hartford, Conn., 1863.

GOLD AND SILVER CURRENCY AND TOTAL MONEY IN THE TREASURY AND IN CIRCULATION.

At the close of the fiscal year 1912 the gold in the United States was divided as follows: Coin and bullion in the Treasury $264,028,-646, and in circulation $610,724,154; certificates in circulation $943,435,618. Thus the total amount of gold coin, bullion and certificates in the United States was $1,818,188,418.

The silver of the United States, for the same year, was divided as follows: Standard dollars in the Treasury $25,785,046, and in circulation $70,339,574; certificates in circulation $469,224,400; subsidiary coin in the Treasury $25,554,007 and in circulation $145,034,198. Thus the total standard dollars and certificates in the Treasury and in circulation amounted to $565,349,020, and the amount of subsidiary coin to $170,588,205.

AGGREGATE SAVINGS DEPOSITS OF SAVINGS BANKS, NUMBER OF DEPOSITORS, AND AVERAGE AMOUNT DUE TO EACH DEPOSITOR: YEAR ENDED JUNE 30, 1912.

At the end of the fiscal year 1912 there were 1,922 Savings Banks in the United States. (This includes only mutual and stock savings banks transacting chiefly a savings bank business) and they had depositors to the number of 10,010,304. The total amount of the deposits for the year was $4,451,818,522.-88 or an average deposit to each depositor of $444.72.

PRINCIPAL STEAMSHIP ROUTES FROM NORTH AMERICA.

HIGHEST AND LOWEST CONTINENTAL ALTITUDES.

In order to compare the elevations in the United States with those in foreign countries the following list is given, but many of the figures must be considered as approximate only:

	Highest point.		Lowest point.	
	Name.	Elevation (feet).	Name.	Below Sea Level (feet).
North America	Mount McKinley, Alaska	20,300	Death Valley, California	276
South America	Mount Aconcagua, Chile-Argentina	23,080	Sea level	
Europe	Mont Blanc, France	15,782	Caspian Sea, Russia	86
Asia	Mount Everest, India-China	29,002	Dead Sea, Palestine	1,290
Africa	Kibo Peak, German East Africa	19,320	Desert of Sahara	150
Australia	Mount Kosciusko, New South Wales	7,328	Lake Torrens, South Australia	25

U. S. Geological Survey.

CIRCULATION STATEMENT, JULY 1 AND AUG. 1, 1913

	General Stock of Money in the United States.		aHeld in Treasury as Assets of the Government.		Money in Circulation.			
	July 1, 1913.	August 1, 1913.	July 1, 1913.	August 1, 1913.	July 1, 1913.	August 1, 1913.	August 1, 1912.	January 1, 1879.
Gold coin (including bullion in Treasury)....	$1,868,790,860	$1,872,993,458	$173,084,093	$174,725,676	$608,979,598	$606,015,613	$608,746,370	$96,262,850
Gold Certificates b	....	....	78,194,420	91,691,755	1,008,532,749	1,000,560,414	946,115,889	21,189,280
Standard Silver Dollars..........	565,618,020	565,633,020	9,991,650	9,590,589	72,076,361	72,173,431	70,537,708	5,790,721
Silver Certificates b..........	....	....	13,360,808	13,290,883	470,189,192	470,578,117	472,747,327	413,360
Subsidiary Silver..........	175,471,210	175,582,664	20,765,511	20,174,519	154,705,699	155,408,145	145,149,876	67,982,601
Treasury Notes of 1890..........	2,660,000	2,645,000	3,219	4,361	2,656,781	2,640,639	2,898,427	....
United States Notes..........	346,681,016	346,681,016	8,757,310	8,057,253	337,923,706	338,623,763	338,183,239	c310,288,511
National Bank Notes..........	759,157,906	759,293,191	42,895,985	48,402,190	716,261,921	710,891,001	702,193,960	314,339,398
Total..........	3,718,379,012	3,722,828,349	347,053,005	365,937,226	3,371,326,007	3,356,891,123	3,286,572,798	816,266,721

Population of continental United States August 1, 1913, estimated at 97,478,000; circulation per capita, $34.44.

a This statement of money held in the Treasury as assets of the Government does not include deposits of public money in National Bank Depositaries to the credit of the Treasurer of the United States, amounting to $57,834,251.17. For a full statement of assets see Public Debt statement.

b For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government.

c Includes $33,190,000 Currency Certificates, Act June 8, 1872.

RESOURCES AND LIABILITIES OF SAVINGS, STATE AND PRIVATE BANKS AND LOAN AND TRUST COMPANIES FOR THE YEAR ENDED JUNE 30, 1912.

The 1,922 Savings Banks in the United States at the end of the fiscal year 1912 had resources and liabilities amounting to the grand total of $4,922,723,290.63. For the same period the 13,381 State Banks had resources and liabilities amounting to $3,897,770,826.71; the 1,091 Private Banks for that year had resources and liabilities to the amount of $196,940,397.42; and the 1,410 Loan and Trust Companies had total liabilities and resources amounting to $5,107,444,382.27.

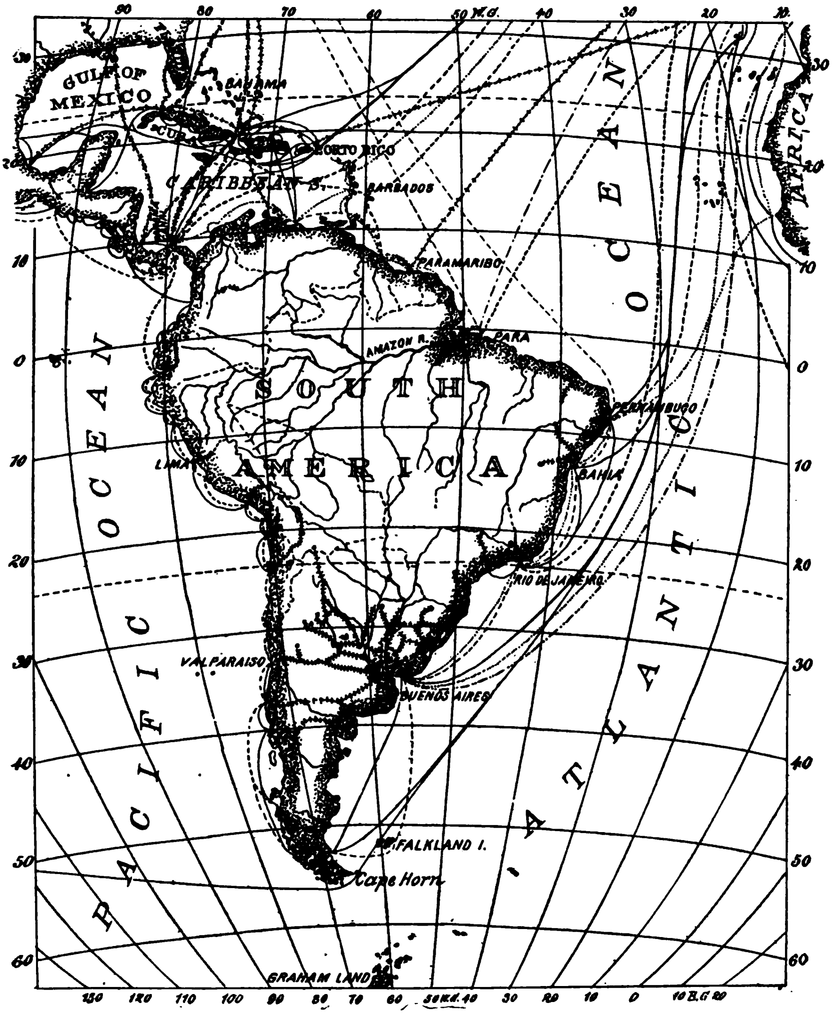
PEOPLE OF NO DISTINCTIVE RACE

The Basques in the western Pyrenees of France and Spain, about 60,000, probably descendants and remnants of the old Iberians; the Dravidians about 60 millions in Hindustan, and the Deccan, the presumed primitive race of India, with the Tribes Gondas, Kolapoors, Telugas, Tamils, etc.; the inhabitants of the Arctic regions of Asia and North America, the Kamtchadales, Yukagirs, Eskimo, Tchooktchees, Aleutians.; the Hottentots and Bushmen (Korana, Gricqua, Namaqua, etc.) in southwest Africa; the Gipsies, a peculiar nomadic tribe scattered over the whole of Europe, west Asia and Africa.

SUMMARY OF TRANSACTIONS OF THE POSTAL SAVINGS SYSTEM JAN. 1911—MAY 1913.

[Source: Post Office Department.]

Month.	Number of offices at close of month.	Deposits.	With-drawals.	Balance to credit of depositors.	Savings cards and stamps.			Net cash receipts to close of month.	Balance on deposit in banks.
					Sold.	Converted into Deposits.	Outstanding at close of month		
		Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.
January	48	61,805	1,704	60,101	980.40	429.00	551.40	60,652.40	....
February	48	81,758	7,990	133,869	822.50	402.00	971.90	134,922.90	110,844.38
March	48	80,701	12,609	201,961	652.80	498.00	1,126.70	203,287.00	191,878.97
April	48	82,646	16,165	268,442	398.30	338.00	1,187.00	269,814.00	264,508.32
May	93	154,505	28,016	394,931	735.10	581.00	1,341.10	396,440.10	381,977.90
June	400	316,714	34,500	677,145	1,236.60	690.00	1,887.70	679,310.40	571,670.90
July	1,000	578,817	73,907	1,182,055	2,911.90	1,851.00	2,948.60	1,189,384.73	973,390.73
August	1,280	1,175,618	184,819	2,172,854	7,689.30	3,936.00	6,701.90	2,184,542.91	1,535,137.50
September	1,973	2,185,438	282,645	4,075,647	12,891.70	6,720.00	12,873.60	4,095,768.66	2,993,018.77
October	3,148	2,837,918	473,304	6,440,261	17,216.50	11,330.00	18,760.10	6,465,399.84	5,439,713.24
November	4,185	2,911,476	671,763	8,679,974	18,139.40	12,844.00	24,055.50	8,714,249.44	8,026,847.08
December	5,185	2,919,872	985,170	10,614.676	14,429.20	14,725.00	23,759.70	11,073,236.77	9,668,301.52
1912.									
January	6,167	3,109,703	985,607	12,738,772	17,793.20	13,859.00	27,873.90	12,834,521.23	11,970,140.27
February	6,666	3,032,951	1,460,357	14,311,366	16,587.00	14,213.00	30,247.90	14,417,264.82	14,090,391.01
March	7,163	3,065,452	1,358,040	16,018,778	17,386.00	15,356.00	32,277.90	16,139,113.58	15,851,145.64
April	7,866	2,980,563	1,532,912	17,466,429	15,093.80	13,968.00	33,403.70	17,588,425.84	16,686,291.88
May	8,865	2,972,903	1,559,023	18,880,309	13,494.30	12,887.00	34,011.00	19,045,792.61	18,111,085.92
June	9,907	2,961,646	1,604,871	20,237,084	12,666.70	12,657.00	34,020.70	20,375,202.48	18,586,042.32
July	11,037	3,271,396	1,736,495	21,771,985	12,893.80	12,756.00	34,158.50	22,086,518.31	20,297,069.84
August	12,111	3,536,960	2,563,517	22,745,428	16,855.40	13,836.00	37,177.90	23,073,529.17	21,979,129.43
September	12,134	3,323,733	1,912,360	24,156,801	12,787.80	11,999.00	37,966.70	24,487,849.47	23,482,125.77
October	12,130	3,449,375	2,011,519	25,594,657	13,798.30	12,738.00	39,027.00	25,915,290.26	24,946,302.40
November	12,166	3,616,985	2,089,565	27,122,077	13,427.90	12,850.00	39,604.90	27,445,986.97	26,428,361.07
December	12,177	3,250,096	2,315,114	28,057,059	11,405.50	13,505.00	37,505.40	28,361,251.97	26,341,644.33
1913.									
January	12,174	3,637,451	3,162,367	28,532,143	16,055.80	13,702.00	39,859.20	30,190,413.28	28,149,391.57
February	12,167	3,460,541	1,966,359	30,026,325	13,828.60	12,517.00	41,170.80	30,606,869.71	29,607,322.78
March	12,160	3,714,762	2,464,672	31,276,415	14,596.80	14,407.00	41,360.60	31,857,334.90	30,812,839.46
April	12,158	3,458,651	2,561,712	32,173,354	13,175.60	12,983.00	41,553.20	32,731,580.94	31,016,514.45
May	12,158	3,593,286	2,709,578	33,057,062	11,966.90	12,643.00	40,877.10	33,613,043.11	31,871,892.76



PRINCIPAL STEAMSHIP ROUTES FROM SOUTH AMERICA.

Ocean Marine Insurance.

Twenty-nine marine insurance companies reporting to the New York State Insurance Department had on January 1, 1913 assets of $37,742,590, surplus of $17,634,538, and premiums earned in preceding year $15,849,-322, losses incurred $8,496,570, risks written to policy holders $12,226,276,614.

The first savings banks in the United States were established at Boston and Philadelphia in 1816 and in New York in 1819. The postal savings bank system was established by an Act of Congress June 25, 1910, and on Jan. 3, 1911 one city in each state was selected for the opening of the first postal savings banks.

NOTABLE CONFLAGRATIONS IN THE WORLD'S HISTORY.

From "The Insurance Year Book," reprinted by permission of "The Spectator Company," New York and Chicago.

Even before man began to congregate and build cities, there existed the danger of prairie and forest fires; but these, except in a minor way, were not especially destructive of other property. When cities had been built and many thousands of people came to be housed within a small area, the danger of fire and its capacity for doing harm to men and their property were greatly augmented; and as cities increased in size, the fire hazard and the accumulated values subject to destruction were both correspondingly multiplied. During the last four thousand years many cities have been swept by fire, some of them several times; and some have been practically obliterated. Below will be found a list, compiled from various sources, of some of the more important fires of history, comprising those most notable because of the values or lives destroyed, or for some peculiar reason:

Year.	Location.
B.C.	
1897	Sodom and Gomorrah
1400	Jerusalem
1141	Ephesus
586	Jerusalem
480	Plataea
497	Athens
390	Rome
241	Rome
215	Rome
212	Rome
146	Corinth
50	Rome
48	Alexandria
13-14	Rome
12	Rome
A. D.	
59	Lyons
64	Rome
70	Jerusalem
80	Rome
154	Rome
154	Antioch
188	Rome
197	Lyons
260	Bordeaux
273	Alexandria
393	Constantinople
465	Constantinople
532	Constantinople
558	Paris
640	Alexandria
667	Rochester
741	York Minster
781	Constantinople
798	London
802-7	Constantinople
807	Peterborough
893	London
917	Cordova
978	Cork
982	London
1004	Norwich
1010	Northampton
1013	Cork
1069	York
1086	London
1087	London
1092	London
1102	Winchester
1106	Venice
1113	Mons
1113	Worcester
1116	Bath
1118	Nantes
A. D.	
1123	Lincoln
1130	Rochester
1135	London
1137	York
1137	Bath
1140	Nottingham
1171	Canterbury
1171	Cairo
1189	Carlisle
1190	Dublin
1203	Constantinople
1204	Doncaster
1215	Bruges
1283	Dublin
1292	Carlisle
1299	Westminster
1321	Geneva
1327	Munich
1333	Geneva
1349	Newcastle-upon-Tyne
1385	Edinburgh
1388	Dunkirk
1401	Edinburgh
1405	Berne
1405	Brussels
1430	Geneva
1471	Chester
1491	Dresden
1507	Norwich
1512	Brest
1542	Edinburgh
1544	Edinburgh
1570	Moscow
1576	Antwerp
1612	Cork
1631	Magdeburg
1633	Constantinople
1656	Jeddo
1666	London
1667	Archangel
1675	Northampton
1676	Southwark
1682	Wapping, London
1689	Prague
1692	Salem
1694	Warwick
1694	Dieppe
1700	Charleston
1702	Bergen
1728	Copenhagen
1729	Constantinople
1731	Baireuth
1736	Peasmore
1737	Panama
A. D.	
1737	Moscow
1737	Jaroslaw
1738	Martinique
1742	Smyrna
1744	Brest
1745	Constantinople
1748	Moscow
1749	Constantinople
1750	Constantinople
1750	Moscow
1751	Constantinople
1752	Moscow
1753	Smyrna
1753	Archangel
1756	Berghen
1756	Constantinople
1758	Savannah
1759	Salonica
1760	Boston
1764	Königsberg
1765	Belgrade
1769	Konigsberg
1769	Constantinople
1769	St. John's
1771	Constantinople
1771	St. Petersburg
1772	Smyrna
1773	Moscow
1775	Limehouse
1775	St. George
1776	St. Kitts
1776	New York
1777	New Orleans
1778	Charleston
1778	New York
1778	Constantinople
1780	St. Petersburg
1780	St. Petersburg
1782	Constantinople
1782	Constantinople
1784	Port-au-Prince
1784	Brest
1784	Constantinople
1784	Rokitzan, Bohemia
1790	Carlscrona
1791	Constantinople
1792	Constantinople
1793	Archangel
1794	Copenhagen
1794	Wapping, London
1795	Copenhagen
1795	Constantinople
1796	Smyrna
1796	Barbados

Year.	Location.
A. D.	
1796	Baltimore
1797	Scutari
1798	Wilmington
1799	Peru
1799	Constantinople
1799	Manila
1802	Liverpool
1803	Bombay
1805	St. Thomas
1808	Spanish T'n, Trinidad
1811	Smyrna
1812	Moscow
1814	Rangoon
1816	Constantinople
1817	Pt. Louis, Mauritius
1818	Constantinople
1820	Canton
1820	Savannah, Ga.
1820	Paris
1820	Port-au-Prince
1821	Paramaribo
1822	Canton
1824	Cairo
1825	New Brunswick
1826	St. John's, N. F.
1826	Constantinople
1827	Abo, Finland
1831	Constantinople
1831	Bristol
1831	St. Thomas, W. I.
1833	Manila
1833	Constantinople
1834	Houses of Parliament, London
1835	New York
1836	Constantinople
1837	Surat
1837	St. Petersburg
1837	Naples
1838	Charlestown
1839	New York
1841	Smyrna
1842	Hamburg
1842	Liverpool
1845	Quebec
1845	Smyrna
1845	New York
1846	St. John's, N. F.
1846	Albany
1848	Orel, Russia
1848	Constantinople
1848	Albany, N. Y.
1849	St. Louis
1851	San Francisco
1853	Montreal
1852	Sacramento City
1853	Constantinople
1854	Gateshead
1858	Astrakan
1858	Valparaiso
1858	Auckland
1859	Key West
1859	St. Louis
1859	Constantinople
1860	Barbadoes
1861	Mendoza, S. A.
1861	Limoges
1861	London
1861	Charleston
1862	Enschede, Holland
1862	Troy
A. D.	
1862	St. Petersburg
1862	Marseilles
1862	Constantinople
1863	Monastir
1864	Georgetown
1864	Hankow
1865	Port-au-Prince
1865	New York
1865	Constantinople
1865	Manila
1866	London
1866	Portland, Me.
1866	Quebec
1866	Yokahama
1868	Charleston, S. C.
1868	Albany, N. Y.
1869	Philadelphia
1870	Constantinople
1870	Pera, Turkey
1870	Sam-Sun, Turkey
1870	Chicago
1871	Chicago
1872	Constantinople
1872	Boston
1873	Alexandra Palace, London
1873	Havana
1874	Constantinople
1874	Pimlico, London
1874	Chicago
1875	Oshkosh
1875	Virginia City
1875	Iquique
1876	St. John's
1876	Soderhamn, Sweden
1876	Quebec
1876	St. Hyacinth
1877	St. John, N. B.
1877	Pittsburgh
1879	Irkutsk, Siberia
1879	New York
1879	Boston
1882	Kingston, Jamaica
1882	Leadville, Colorado
1882	Wood Street, London
1883	Vienna
1884	Bayswater, London
1885	Aspinwall
1887	Paris
1887	Exeter, England
1888	Sundsvall
1889	Seattle
1889	New York
1889	Spokane
1889	Boston
1889	Lynn
1890	Fort de France, Martinique
1890	Sydney
1892	New Orleans
1892	New Orleans
1892	Tokio
1892	Milwaukee
1892	St. John's, N. F.
1893	Boston
1894	Shanghai
1894	Canton, China
1896	Guayaquil
1897	Melbourne
1897	London
A. D.	
1897	London
1897	Paris
1898	Nijni-Novgorod
1899	Philadelphia
1900	Hoboken
1900	Bayonne
1900	Ottawa-Hull, Canada
1901	Jacksonville
1901	Antwerp
1901	Montreal
1902	Paterson
1902	Waterbury
1904	Baltimore
1904	Aesland, Norway
1904	Toronto
1904	Halifax
1904	Rochester
1905	New Orleans
1906	San Francisco
1906	Valparaiso, Chile
1906	Wellington, N. Z.
1907	Iquique, Chile
1907	Hakodate, Japan
1907	Kingston, Jamaica
1908	Chelsea, Mass.
1908	Noda Soy, Japan
1908	Niigata, Japan
1908	Chisholm, Minn.
1908	Port-au-Prince, Hayti
1908	Paris, France
1908	El Oro, Mexico
1908	Rostov-on-Don, Russia
1909	Acapulco, Mexico
1909	Osaka, Japan
1909	Valdivia, Chile
1909	London, England
1910	Campbellton, N. B.
1910	Wajima, Japan
1910	Brussels, Belgium
1910	U. S. and Canada forest fires
1911	Santiago, Chile
1911	Aux Cayes, Hayti
1911	Tokio, Japan
1911	Yamagata, Japan
1911	Bangor, Me.
1911	N. Y., "Triangle"
1911	Albany, N. Y.
1911	Kirin, Manchuria
1911	Constantinople
1911	Hankow, China
1911	Nanking, China
1912	Peking, China
1912	Osaka, Japan
1912	N. Y., "Equitable"
1912	Valdivia, Chile
1912	Tien-Tsin, China
1912	Pao Ting Fu, China
1912	Tokio, Japan
1912	Damascus, Syria
1912	Constantinople
1912	Castellon, Spain
1912	Chorlu, Turkey
1912	Adrianople, Turkey
1912	Houston, Texas
1913	Tokio, Japan
1913	Numadza, Japan
1913	Scutari, Turkey
1913	Adrianople, Turkey

PRINCIPAL STEAMSHIP ROUTES FROM EUROPE.

FIRES, URBAN AND RURAL, IN THE UNITED STATES: NUMBER, LOSS ON BUILDINGS AND CONTENTS, BY KINDS OF BUILDINGS, AND LOSS PER CAPITA, CALENDAR YEAR 1907.

[Source: Report of the Geological Survey, Department of the Interior.]

	Urban.	Rural.	Total.
Fire loss:			
Brick, etc., buildings—	*Dollars.*	*Dollars.*	*Dollars.*
Buildings	19,816,474	11,276,213	31,092,687
Contents	29,092,270	8,240,310	37,332,580
Total	48,908,744	19,516,523	68,425,267
Frame buildings—			
Buildings	30,357,151	47,707,056	78,064,207
Contents	27,827,388	40,767,847	68,595,235
Total	58,184,539	88,474,903	146,659,442
Totals:			
Buildings	50,173,625	58,983,269	109,156,894
Contents	56,919,658	49,008,157	105,927,815
Grand total	107,093,283	107,991,426	215,084,709
Number of fires:			
In brick, etc., buildings	25,297	10,843	36,140
In frame buildings	80,109	49,008	129,117
Total	105,406	59,851	165,257
Loss per capita	2.54	2.49	2.51

FIRES IN THE UNITED STATES: POPULATION, LOSS AND PER CAPITA LOSS, BY GEOGRAPHIC DIVISIONS, CALENDAR YEAR 1907.

[Source: Report of the Geological Survey, Department of the Interior.]

Geographic division.	Total population.	Total fire loss.	Fire loss per capita.
North Atlantic:			
Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania	23,779,013	*Dollars.* 59,447,532	*Dollars.* 2.50
South Atlantic:			
Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida	11,574,988	25,349,223	2.19
North Central:			
Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas	29,026,645	68,793,148	2.37
South Central:			
Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas	16,368,558	59,908,922	3.66
Western:			
Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Idaho, Washington, Oregon, and California	4,783,557	12,676,426	2.65

TOTAL WATER SURFACE.

		Sq. Miles.	Fathoms Depth. Max.	Average.
The Pacific Ocean	48 p. c.	67,570,000	5,350	2,100
" Atlantic Ocean	24 p. c.	34,700,000	4,730	1,800
" Indian Ocean	21 p. c.	28,900,000	3,830	2,000
" Arctic Sea	3 p. c.	4,470,000	2,650	1,500
" Antarctic Sea	4 p. c.	5,610,000	3,130	1,600

ANNUAL FIRE LOSSES IN THE UNITED STATES FOR THIRTY-EIGHT YEARS—1875-1912

From "The Insurance Year Book," reprinted by permission of "The Spectator Company," New York and Chicago.

Year.	Aggregate Property Loss.	Aggregate Insurance Loss.	Year.	Aggregate Property Loss.	Aggregate Insurance Loss.
1875.....	$78,102,285	$39,327,400	1894.....	$140,006,484	$89,574,699
1876.....	64,630,600	34,374,500	1895.....	142,110,233	84,689,030
1877.....	68,265,800	37,398,900	1896.....	118,737,420	73,903,800
1878.....	64,315,900	36,575,900	1897.....	116,354,575	66,722,145
1879.....	77,703,700	44,464,700	1898.....	130,593,905	73,796,080
1880.....	74,643,400	42,525,000	1899.....	153,597,830	92,683,715
1881.....	81,280,900	44,641,900	1900.....	160,929,805	95,403,650
1882.....	84,505,024	48,875,131	1901.....	165,817,810	100,798,645
1883.....	100,149,228	54,808,664	1902.....	161,488,355	94,775,045
1884.....	110,008,611	60,679,818	1903.....	145,302,155	*104,000,000
1885.....	102,818,796	57,430,709	1904.....	†229,198,050	*144,000,000
1886.....	104,924,750	60,506,564	1905.....	†165,221,650	*116,000,009
1887.....	120,283,055	69,659,508	1906.....	†518,611,800	*292,000,000
1888.....	110,885,665	63,965,724	1907.....	†215,084,709	*127,000,000
1889.....	123,046,833	73,679,465	1908.....	†217,885,850	*157,000,000
1890.....	108,993,792	65,015,465	1909.....	†188,705,150	*143,000,000
1891.....	143,764,967	90,576,918	1910.....	†214,003,300	*175,000,000
1892.....	151,516,098	93,511,936	1911.....	†217,004,575	*190,000,000
1893.....	167,544,370	105,994,577	1912.....	†206,438,900	*194,000,000
			Totals..	$5,543,654,695	$3,539,359,583

Figures for years prior to 1904 are from Chronicle Fire Tables.
*Estimated by publishers of the Insurance Year Book.
†From National Board Tables.

FINANCIAL STANDING OF LIFE INSURANCE COMPANIES.

The combined aggregates of the Financial Standing, etc., of the 224 principal insurance companies show that the capital stock in 1912 was $44,329,379. The principal sources of income of these companies for the same period were as follows: New premiums, $70,382,387; renewed premiums, $395,627,108; received for annuities, $6,053,215; dividends, interest, etc., $156,288.333; received for rents, $7,027,280; and all other receipts, $20,015,381; thus making the total income, $655,393,704. The expenditures of these same companies for the same period were as follows: Paid for death losses, $151,176,491; paid for matured endowments, $52,607,566; annuities paid, $7,287,767; paid for surrendered, lapsed and purchased policies, $77,219,329; dividends to policyholders, $78,716,564; dividends to stockholders, $1,573,517; commissions, salaries and traveling expenses of agents, $61,693,343; medical fees, salaries and other charges of employees, $19,854,072; and all other expenditures, $33,219,833; thus making the total expenditures of the companies, $483,348,282. The excess of the incomes over the expenditures for the year 1912 amounted to $172,045,422.

The assets amounting to $3,597,659,447 of admitted assets and $21,988,858 of assets not admitted, were as follows: Real estate owned, $127,684,405; bond and mortgage loans, $1,197,781,579; bonds owned, $1,493,506,968; stocks owned, $81,677,178; collateral loans, $15,191,616; premium notes and loans, $539,245,042; cash in office and bank, $50,017,640; net deferred and unpaid premiums, $42,606,061; all other assets, $49,948,958. The liabilities of these same companies amounting to $3,168,194,661 were divided as follows: Reserve, $2,988,642,224; losses and claims not paid, $16,987,072; claims resisted, $1,689,163; dividends unpaid, $87,202,774; all other liabilities, $73,673,428. The total surplus paid to policyholders (including capital) amounted to $429,464,786.

The policy account of these companies was as follows: New business actually paid for, $2,240,434,665; whole life policies in force, $10,163,447,058; endowment policies in force, $3,260,245,355; all other policies in force, $2,132,208,758; total insurance in force, $15,555,901,171; total industrial business written, $842,041,252; total industrial business in force, $3,708,892,514.

From the "Insurance Year Book;" reprinted by permission of "The Spectator Company," New York and Chicago.

At the end of the calendar year 1911 there were 6,113 Building and Loan Associations in the United States having assets to the sum of $1,040,307,713 and a membership of 2,355,066.

The first steam fire engine was invented by Braithwaite, 1829; Ericsson, in New York, produced a similar one in 1840. They were not generally used until 1860. Fire engines driven by motor power first used in 1905.

FIRE, MARINE AND CASUALTY INSURANCE.

FIRE AND MARINE CASUALTY AND MISCELLANEOUS INSURANCE IN THE UNITED STATES IN 1890, AND FROM 1895 TO 1910. TOTAL INCOME OF COMPANIES AND PAYMENTS TO POLICY HOLDERS.

Data from Insurance Year Book, published by permission o The Spectator Company, New York and Chicago.

Fire and Marine Insurance.

Calendar Year.	Stock and Mutual Companies.				
	Number of Companies.	Total Income	Payments to Policy Holders.		
			Losses.	Dividends.	Total.
1890	580	$157,857,983	$75,334,517	$5,433,495	$80,768,012
1895	555	176,300,042	89,673,663	7,705,363	97,379,026
1896	541	172,945,625	83,355,538	6,547,922	89,903,460
1897	530	176,751,124	79,440,595	7,724,657	87,165,252
1898	504	178,320,217	90,051,512	7,923,170	97,974,682
1899	484	184,142,217	106,726,658	7,892,714	114,619,372
1900	493	198,312,577	108,307,171	8,446,110	116,753,281
1901	482	216,452,381	112,008,998	9,011,926	121,020,924
1902	489	239,468,206	113,147,727	10,184,285	123,302,012
1903	526	258,340,036	112,817,357	11,559,470	124,376,827
1904	515	278,340,036	151,264,900	12,855,153	164,120,053
1905	575	293,224,649	125,074,600	14,379,174	139,453,774
1906	597	350,285,740	276,795,627	15,412,212	292,207,839
1907	618	338,232,409	145,597,362	16,223,261	161,820,623
1908	598	334,490,040	165,489,578	17,808,367	183,297,945
1909	598	360,545,341	154,430,781	19,091,596	173,522,377
1910	597	381,545,814	166,789,763	20,709,261	187,499,024
1911	593	388,462,193	183,476,741	18,771,959	202,248,700
1912	595	406,336,104	188,081,546	17,841,956	205,923,502

Calendar Year.	Lloyd's and Interinsurance Associations.			Total.		
	Number of Associations.	Total Income.	Losses Paid.	Number of Companies.	Total Income.	Payments to Policy Holders.
1890	....	....	....	580	$157,857,983	$80,768,012
1895	....	....	....	583	176,300,042	97,379,026
1896	....	....	....	541	172,945,625	89,903,460
1897	....	....	....	530	176,751,124	87,165,252
1898	....	....	....	504	178,320,217	97,974,682
1899	....	....	....	484	184,142,217	114,619,372
1900	....	....	....	493	198,312,577	116,753,281
1901	....	....	....	482	216,452,381	121,020,924
1902	....	....	....	489	239,468,206	123,332,012
1903	37	$2,972,800	$1,057,238	563	261,431,401	125,434,065
1904	35	2,888,366	1,538,505	550	281,228,402	165,658,558
1905	37	3,337,939	1,371,417	612	296,562,588	140,825,191
1906	35	3,637,254	1,441,353	632	353,922,994	293,649,192
1907	36	4,298,640	1,616,001	654	342,531,049	163,436,624
1908	38	4,579,875	1,865,181	636	339,068,915	185,163,126
1909	38	4,719,072	1,938,834	636	365,264,413	175,461,211
1910	31	4,111,214	1,644,002	628	385,657,028	189,143,026
1911	28	4,504,793	1,440,809	621	392,966,986	203,689,509
1912	26	4,424,249	1,991,618	621	410,760,353	207,915,120

Cuba's exports of sugar cane and its products were valued in 1910 at $101,500,000— 70.28 per cent. of the total export.

CORPORATIONS, JOINT-STOCK COMPANIES OR ASSOCIATIONS, AND INSURANCE COMPANIES: YEAR ENDED JUNE 30, 1912.

At the end of the fiscal year ended June 30, 1912, a report based on 32,347 financial and commercial companies and corporations, including banks, banking associations, trust companies, guaranty and surety companies, title insurance companies, building associations (if for profit), and insurance companies not specially exempt, showed that the amount of the capital stock of these companies totaled $2,885,662,855.46; that the amount of bonded and other indebtedness was $621,183,231:34; and that the net income amounted to $451,092,434.64. For the same period, the public service, such as railroad, steamboat, ferryboat and stageline companies; pipe-line, gas and electric-light companies; transportation and storage companies, telegraph and telephone companies, basing the figures on the 24,924 reports received, had a capital stock of $19,320,116,964.23; an indebtedness, bonded and otherwise of $17,531,492,251.26; and a net income of $806,324,299.38. The third class, industrial and manufacturing, such as mining, lumber and coke companies; rolling mills; foundry and machine shops; sawmills; flour, woolen, cotton, and other mills; manufacturers of cars, automobiles, elevators, agricultural implements, and other articles manufactured wholly or in part from metal, wood, or other material; manufacturers or refiners of sugar, molasses, syrups, or other products; ice or refrigerating companies; slaughter-house, tannery, packing, or canning companies, have a capital stock of $27,288,587,679.17; an indebtedness, bonded and otherwise amounting to $8,525,627,890.64; and a total income of $1,309,819,271.81. This report was based on the 92,737 returns received. The 62,270 reports received from the mercantile class, including all dealers (not otherwise classed as producers or manufacturers), in coal, lumber, grain, produce, and all goods, wares, and merchandise, show a capital stock of $3,584,309,070.14; an indebtedness, bonded and otherwise, of $2,092,664,389.92; and a net income of $363,306,165.42. The last, or miscellaneous class, such as architects, contractors, hotels, the theatres, or other companies or associations not otherwise classed, had a capital stock of $6,988,462,356.42; an indebtedness, bonded and otherwise amounting to $3,392,570,198.24; and a net income of $277,165,076.67. This report was based on 75,674 returns received.

Table Showing Rate of Income on Stocks

Purchased at the Following Prices (Par Value Being $100) and Bearing Interest at the Following Rates

Paid	4%	5%	6%	7%	8%	9%	10%
$80	5.	6.25	7.50	8.75	10.	11.25	12.50
90	4.44	5.55	6.66	7.77	8.88	10.	11.11
95	4.21	5.26	6.31	7.36	8.42	9.47	10.52
105	3.80	4.76	5.71	6.66	7.61	8.57	9.52
110	3.63	4.54	5.45	6.36	7.27	8.18	9.09
115	3.47	4.34	5.21	6.08	6.95	7.82	8.09
120	3.33	4.16	5.	5.83	6.66	7.50	8.33
125	3.20	4.	4.80	5.60	6.40	7.20	8.
126	3.17	3.96	4.76	5.55	6.34	7.14	7.93
127	3.14	3.93	4.72	5.51	6.29	7.08	7.87
128	3.12	3.90	4.68	5.46	6.25	7.03	7.81
129	3.10	3.87	4.65	5.42	6.20	6.97	7.75
130	3.07	3.84	4.61	5.38	6.15	6.92	7.69
131	3.05	3.81	4.58	5.34	6.10	6.87	7.63
132	3.03	3.78	4.54	5.30	6.06	6.81	7.57
133	3.	3.75	4.51	5.26	6.01	6.76	7.51
134	2.98	3.73	4.47	5.22	5.97	6.71	7.46
135	2.96	3.70	4.44	5.18	5.92	6.66	7.40
136	2.94	3.67	4.41	5.14	5.88	6.61	7.35
137	2.91	3.63	4.37	5.10	5.83	6.56	7.29
138	2.89	3.62	4.34	5.07	5.79	6.52	7.24
139	2.87	3.59	4.31	5.03	5.76	6.47	7.19
140	2.85	3.57	4.28	5.	5.71	6.42	7.14
141	2.83	3.54	4.25	4.96	5.67	6.38	7.09
142	2.81	3.52	4.22	4.92	5.63	6.33	7.04
143	2.79	3.49	4.19	4.89	5.59	6.29	6.99
144	2.77	3.47	4.16	4.86	5.55	6.25	6.94
145	2.75	3.44	4.13	4.82	5.51	6.20	6.89
146	2.73	3.42	4.10	4.79	5.47	6.16	6.84
147	2.72	3.40	4.08	4.76	5.44	6.12	6.80
148	2.70	3.37	4.05	4.72	5.40	6.08	6.75
149	2.68	3.35	4.02	4.69	5.36	6.04	6.71
150	2.66	3.33	4.	4.66	5.33	6.	6.66
155	2.58	3.22	3.87	4.51	5.16	5.80	6.45
160	2.50	3.12	3.75	4.37	5.	5.62	6.25
165	2.42	3.03	3.63	4.24	4.34	5.45	6.06
170	2.35	2.94	3.52	4.11	4.70	5.29	5.88

Quick Method for Calculating Interest

Where the Time is for Days Only

Rule.—To find the interest on any given sum for any number of days multiply the principal by the number of days, and divide as follows: At 5%, divide by 72; at 6%, divide by 60; at 7%, divide by 52; at 8%, divide by 45; at 9%, divide by 40.

Table of Days for Computing Interest

To Find the Number of Days from any Day of any one Month to the same Day of any other Month

From	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
To January	365	334	306	275	245	214	184	153	122	92	61	31
February	31	365	337	306	276	245	215	184	153	123	92	62
March	59	28	365	334	304	273	243	212	181	151	120	90
April	90	59	31	365	335	304	274	243	212	182	151	121
May	120	89	61	30	365	334	304	273	242	212	181	151
June	151	120	92	61	31	365	335	304	273	243	212	182
July	181	150	122	91	61	30	365	334	303	273	242	212
August	212	181	153	122	92	61	31	365	334	304	273	243
Septem'r	243	212	184	153	123	92	62	31	365	335	304	274
October	273	242	214	183	153	122	92	61	30	365	334	304
Nove'ber	304	273	245	214	184	153	123	92	61	31	365	335
Dece'ber	334	303	275	244	214	183	153	122	91	61	30	365

N.B.—In leap year, if the last day of February comes between, add one day to the number in the table.

EXAMPLE.—How many days from May 10th to Sept. 13th? From the above table we get 123; add 3 for difference between 10 and 13, and we get 126, the number of days required.

COMPARATIVE NON-PARTICIPATING PREMIUM RATES OF AMERICAN LIFE INSURANCE COMPANIES, 1860, 1870, 1880, 1890, 1900, 1910—WHOLE LIFE PLAN.*

AVERAGE PREMIUM RATES PER $1,000 INSURANCE.

Age.	1860.		1870.		1880.		1890.		1900.		1910.	
	Number of Companies.	Average Rate.	Number of Companies.	Average Rate.	Number of Companies.	Average Rate.	Number of Companies.	Average Rate.	Number of Companies.	Average Rate.	Number of Companies.	Average Rate.
20	6	$15.27	26	$13.57	..	......	4	$14.61	5	$14.38	50	$15.23
21	6	15.68	28	13.88	.	......	4	14.81	5	14.72	76	15.65
22	6	16.11	28	14.19	..	......	4	15.07	5	15.08	76	16.00
23	6	16.58	28	14.49	..	......	4	15.28	5	15.45	76	16.37
24	6	17.03	28	14.80	..	......	4	15.62	5	15.85	76	16.75
25	6	17.55	29	15.20	4	$15.64	4	15.93	5	16.27	76	17.16
26	6	18.08	29	15.63	4	16.04	4	16.36	5	16.72	76	17.58
27	6	18.63	29	16.08	4	16.46	4	16.79	5	17.17	76	18.03
28	6	19.19	29	16.55	4	16.91	4	17.26	5	17.66	76	18.49
29	6	19.76	29	17.06	4	17.37	4	17.74	5	18.17	76	19.00
30	6	20.29	29	17.52	4	17.87	4	18.26	5	18.70	76	19.51
31	6	20.87	29	18.02	4	18.38	4	18.81	5	19.27	76	20.07
32	6	21.48	29	18.59	4	18.94	4	19.38	5	19.87	76	20.64
33	6	22.13	29	19.16	4	19.51	4	19.97	5	20.50	76	21.26
34	6	22.81	29	19.79	4	20.15	4	20.62	5	21.17	76	21.90
35	6	23.53	29	20.44	4	20.81	4	21.30	5	21.88	76	22.59
36	6	24.30	29	21.14	4	21.51	4	22.02	5	22.62	76	23.31
37	6	25.07	29	21.86	4	22.23	4	22.78	5	23.41	76	24.07
38	6	25.93	29	22.64	4	23.03	4	23.60	5	24.25	76	24.88
39	6	26.83	29	23.46	4	23.85	4	24.45	5	25.14	76	25.74
40	6	27.75	29	24.33	4	24.76	4	25.38	5	26.09	76	26.65
41	6	28.70	29	25.24	4	25.71	4	26.35	5	27.09	76	27.62
42	6	29.64	29	26.20	4	26.72	4	27.37	5	28.17	76	28.64
43	6	30.66	29	27.21	4	27.79	4	28.46	5	29.31	76	29.74
44	6	31.74	29	28.30	4	28.94	4	29.64	5	30.53	76	30.91
45	6	32.89	29	29.46	4	30.16	4	30.89	5	31.83	76	32.14
46	6	34.12	29	30.70	4	31.46	4	32.21	5	33.20	76	33.46
47	6	35.43	29	32.19	4	32.86	4	33.63	5	34.66	76	34.87
48	6	36.87	29	33.41	4	34.34	4	35.11	5	36.22	76	36.37
49	6	38.46	29	34.98	4	35.94	4	36.74	5	37.86	76	37.97
50	6	40.20	29	36.63	4	37.65	4	38.48	5	39.62	76	39.69
51	6	42.09	29	38.45	4	39.46	4	40.28	5	41.48	76	41.49
52	6	44.10	29	40.35	4	41.38	4	42.22	5	43.46	76	43.43
53	6	46.25	29	42.38	4	43.45	4	44.32	5	45.57	76	45.49
54	6	48.59	29	44.55	4	45.68	4	46.53	5	47.81	76	47.69
55	6	51.12	29	46.88	4	48.10	4	48.92	5	50.20	76	50.04
56	5	54.29	27	49.37	4	50.72	4	51.49	5	52.74	75	52.53
57	5	57.14	27	52.39	4	53.54	4	54.27	5	55.45	75	55.22
58	5	60.18	27	54.88	4	56.54	4	57.21	5	58.34	75	58.08
59	5	63.29	27	57.85	4	59.75	4	60.36	5	61.42	75	61.16
60	5	66.19	27	60.92	4	63.18	4	63.73	5	64.71	75	64.44

* The premium rates for 1860 and 1870 are compiled from the Reports of the New York Insurance Department of 1861 and 1869, respectively. The rates for 1880 and 1890 are compiled from the Spectator Year Books of 1881 and 1891, and the rates for 1900 and 1910 are from the Spectator Handy Guides for those years.

AREA OF THE LARGEST ISLANDS OF THE EARTH.

	Sq. Miles.		Sq. Miles.		Sq. Miles.		Sq. Miles.
Greenland	837,760	Great Britain	88,000	Luzon	40,930	Haiti	29,810
New Guinea	303,500	Hondo	87,490	Iceland	39,756	Sakhalin	29,114
Borneo	284,840	Celebes	71,470	Mindanao	37,180	Tasmania	26,215
Madagascar	228,600	Java	49,030	Yezo	36,300	Ceylon	25,330
Sumatra	161,610	Cuba	46,000	Novaya Zemlya	35,520	Kuishiu	16,840
New Zealand	104,400	Newfoundland	40,200	Ireland	32,530	Formosa	13,460

ORDINARY AND INDUSTRIAL INSURANCE IN FORCE BY STATES, DECEMBER 31, 1910.*

State.	Total Population 1910.	Ordinary Insurance in Force.	Industrial Insurance in Force.	Total Insurance in Force.	Insurance in Force per Capita.
Alabama	2,138,093	$160,000,997	$8,953,990	$168,954,987	$79
Arizona	204,354	17,706,369	....	17,706,369	87
Arkansas	1,574,449	91,092,866	2,927,661	94,020,527	60
California	2,377,549	391,875,291	40,040,942	431,916,233	182
Colorado	799,024	131,533,563	8,216,272	139,749,835	175
Connecticut	1,114,756	168,463,959	84,541,832	253,005,791	227
Delaware	202,322	24,247,892	17,225,939	41,473,831	205
District of Columbia	331,069	79,258,009	33,152,206	112,410,215	340
Florida	752,619	79,091,347	....	79,091,347	105
Georgia	2,609,121	282,704,932	24,019,716	306,724,648	118
Idaho	325,594	27,892,642	....	27,892,642	86
Illinois	5,638,591	1,007,271,561	103,774,012	1,111,045,573	197
Indiana	2,700,876	321,111,088	95,803,745	416,914,833	154
Iowa	2,224,771	221,095,910	16,620,410	226,031,973	102
Kansas	1,690,949	146,186,246	19,962,756	166,149,002	98
Kentucky	2,289,905	223,247,521	63,297,260	286,544,781	125
Louisiana	1,656,388	149,288,555	29,971,837	179,260,392	108
Maine	742,371	97,241,628	16,509,020	113,750,648	153
Maryland	1,295,346	177,268,672	95,915,434	273,184,106	211
Massachusetts	3,366,416	635,619,342	257,300,837	892,920,179	265
Michigan	2,810,173	304,015,961	47,802,235	351,818,196	125
Minnesota	2,075,708	240,918,006	16,825,506	257,743,512	124
Mississippi	1,797,114	116,706,215	....	116,706,215	65
Missouri	3,293,335	423,090,516	122,423,104	545,513,620	166
Montana	376,053	54,149,564	1,765,045	55,914,609	149
Nebraska	1,192,214	124,556,740	7,452,286	132,009,026	111
Nevada	81,875	11,983,559	....	11,983,559	146
New Hampshire	430,572	53,151,854	14,359,926	67,511,780	157
New Jersey	2,537,167	394,358,783	278,891,717	673,250,500	265
New Mexico	327,301	22,159,552	....	22,159,552	68
New York	9,113,614	1,859,488,827	705,260,714	2,564,749,541	281
North Carolina	2,206,287	156,137,868	9,079,925	165,217,793	75
North Dakota	577,056	55,203,241	....	55,203,241	96
Ohio	4,767,121	691,213,034	197,072,487	888,285,521	186
Oregon	672,765	76,010,451	3,611,500	79,621,951	118
Pennsylvania	7,665,111	1,241,865,748	465,104,712	1,706,970,460	223
Rhode Island	542,610	85,064,017	52,623,684	137,687,701	254
South Carolina	1,515,400	114,622,829	15,116,654	129,739,483	86
South Dakota	583,888	63,579,694	....	63,579,694	109
Tennessee	2,184,789	171,632,371	37,495,347	209,127,718	96
Texas	3,896,542	262,708,661	976,536	263,685,197	68
Utah	373,351	42,606,638	4,334,810	46,941,448	126
Vermont	355,956	57,606,582	7,044,595	64,651,177	182
Virginia	2,061,612	180,205,741	39,269,190	219,474,931	106
Washington	1,141,990	126,583,116	8,802,412	135,385,528	119
West Virginia	1,221,119	94,853,455	14,561,149	109,414,604	90
Wisconsin	2,333,860	224,237,069	35,588,883	259,825,952	111
Wyoming	145,965	16,871,048	....	16,871,048	116

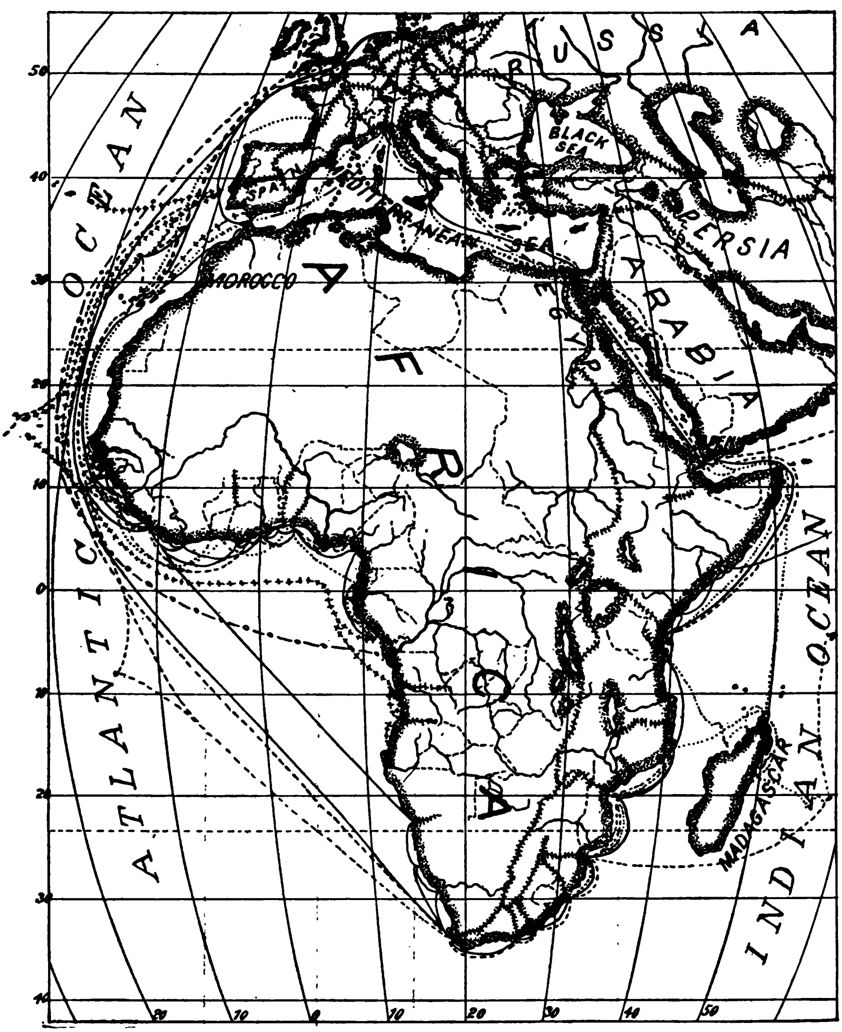
* Compiled from Spectator Year Book, 1911, p. 368.

F. L. Hoffman

HIGHEST MOUNTAINS IN THE WORLD.

(Exceeding 20,000 feet.)

Mountain.	Feet.	Mountain.	Feet.	Mountain.	Feet.	Mountain.	Feet.
Asia—Mt. Everest	29,002	Nanda Devi	25,600	Anconhuma	21,490	Tupungota	20,286
Godwin-Austen	28,278	Mustagata	24,400	Sorata	21,470	Cacaca	20,250
Kunchinginga	28,156	Chumalari	23,946	Illampu	21,490	Haina	20,171
Gusherbrum	26,378	South America—		Huandoy	21,089	San Jose	20,020
Dhawalagiri	26,826			Sajama	21,047	Misti	20,013
Masherbrum	25,600	Aconcagua	22,860	Illimani	21,030	North America—	
Kakapushi	25,560	Mercedario	22,315	Paniri	20,735		
Kutha Kangir	24,740	Huascan	22,051	Chimborazo	20,498	McKinley	20,290



PRINCIPAL STEAMSHIP ROUTES FROM AFRICA.

	Miles.
Length of the Equator	24,900
" " " Meridian	24,858
" " a Tropic	22,853
" " " Polar Circle	9,940
" " the Great Axis (diameter of the Equator)	7,926
" " " Little Axis (diameter through the Poles)	7,400
" " " Parallel Degree on the Equator	69.2
" " " " " in the Tropics	63.5
" " " " " in the Polar Circle	27.7
" " " " " at the Pole	0

The solid contents of the Globe amounts to 260,000,000,000 cubic miles.

CURRENCY OF EUROPEAN COUNTRIES.

COUNTRY. MONEY TABLE.	Standard Monetary Unit, and Approximate Value in U. S. Gold.	Bank Notes and Approximate Equivalent in U. S. Money.		Gold Coins and Approximate Equivalent in U. S. Money.		Sliver Coins and Approximate Equivalent in U. S. Money.		Copper and Nickel Coins and Approximate Equivalent in U. S. Money.	
		£	$	£	$	£	$	£	$
GREAT BRITAIN.						3d.	.06		
	Gold.	5	24.332			6d.	.121	Far-	
4 Farthings = 1 Penny.		10	48.665	Half		1s.	.243	thing.	.005
		20	97.33	Sov'gn	2.433	Florin			
		50	243.325	= 10s.		or 2s.	.486	Half	
12 Pence = 1 Shilling.	Pound	100	486.65			½ Crown		Penny.	.01
	Sterling:	200	973.30	Sov'gn		or 2s. 6d.	.608		
	$4.866½	500	2433.25	= 20s.	4.866	4s.	.973	Penny.	.02
20 Shillings = £1.		1,000	4866.50			5s. or			
						Crown	1.216		
FRANCE.	Gold.	Francs.	$	Francs.	$		$	Sou or	
		50	9.65			50c.	.096½	5c.	.0096½
		100	19.30	5	.97	1f.	.193		
100 Centimes = 1 Franc.	Franc: $0.193	500	96.50	10	1.93	2f.	.386	2 Sou or	
(See Note, page 25.)		1,000	193.00	20	3.86	5f.	.965	10c.	.0193
		Francs.	$	Francs.	$		$		$
BELGIUM.	Gold.	20	3.86			50c.	.096½	1c.	.0019
		50	9.65	10	1.93	1f.	.193	2c.	.0038
		100	19.30			2f.	.386	5c.	.0096
100 Centimes = 1 Franc.	Franc: $0.193	500	96.50	20	3.86	5f.	.965	10c.	.0193
		1,000	193.00					20c.	.0386
		Gulden.	$	Gulden.	$		$	copper.	$
		10	4.02						
NETHERLANDS.	Gold.	25	10.05						
(HOLLAND.)		40	16.08	5	2.01	5c.	.020		
		50	20.10			10c.	.040		
		60	24.12			25c.	.100	½c.	.002
		100	40.20	10	4.02	50c.	.201	1c.	.004
100 Cents = 1 Gulden.	Gulden: $0.402	200	80.40			1 Gul.	.402	2½c.	.010
		300	120.60			2½ Gul.	1.005		
		500	201.00						
		1,000	402.00						

CURRENCY OF EUROPEAN COUNTRIES.—*Continued.*

COUNTRY MONEY TABLE	Standard Monetary Unit, and Approximate Value in U. S. Gold.	Bank Notes and Approximate Equivalent in U. S. Money.		Gold Coins and Approximate Equivalent in U. S. Money		Silver Coins and Approximate Equivalent in U. S. Money.		Copper and Nickel Coins and Approximate Equivalent in U. S. Money.	
		Marks.	$	Marks.	$		$	copper.	$
						50 p. or		1p.	.002
GERMANY.	Gold.	5	1.19			½m.	.119	2p.	.005
		20	4.76	10	2.38	1m.	.238		
		50	11.90			2m.	.476	nickel.	
100 Pfennige = 1 Mark.	Mark: $0.238	100	23.80	20	4.76	3m.	.714	5	.012
		1,000	238.00			5m.	1.19	10	.024
AUSTRIA-HUNGARY.	Gold.	Kronen.	$		$		$	bronze.	$
		10	2.03	4fl.	1.62	1 kr. or		1h.	:002
		20	4.06	10kr. or		½fl.	.203	2h.	.004
		50	10.15	5 fl.	2.03	1fl.	.406		
100 Hellers = 1 Krone.	Krone: $0.203	100	20.30	8fl.	3.24	5kr.	1.015	nickel.	
		1,000	203.00	20kr. or				10h.	.020
				10fl.	4.06			20h.	.040
		Lire.	$	Lire.	$		$	copper.	$
ITALY.	Gold.	5	.965	5	.965	1 lira.	.193	5c.	.0096
		10	1.93					10c.	.0193
		50	9.65	10	1.93	2 lira.	.386	nickel.	
100 Centesimi = 1 Lira.	Lira: $0.193	100	19.30					20c.	.0386
		500	96.50	20	3.86	5 lira.	.965	25c.	.0482
		1,000	193.00						
		Kroner.	$	Kroner.	$	Ore.	$	bronze.	$
								Ore.	
NORWAY, SWEDEN AND DENMARK.	Gold.	1	0.268	5	1.34	10	.02		
		5	1.34	10	2.68	25	.06	1	.0025
		10	2.68	20	5.36	50	.12	2	.005
		50	13.40					5	.125
100 Ore = 1 Krone.	Krone: $0.268	100	26.80			Kroner.			
		500	134.00	Ducat.	2.24	1	.249		
		1,000	268.00			2	.499		

CURRENCY OF EUROPEAN COUNTRIES.—*Continued.*

COUNTRY. MONEY TABLE.	Standard Monetary Unit, and Approximate Value in U. S. Gold.	Bank Notes and Approximate Equivalent in U. S. Money		Gold Coins and Approximate Equivalent in U. S. Money.		Silver Coins and Approximate Equivalent in U. S. Money.		Copper and Nickel Coins and Approximate Equivalent in U. S. Money.	
		Rubles.	$	Rubles.	$	Kopecks.	$	copper.	$
						5	.025	Kopecks	
		1	.515	5	2.57	10	.05		
RUSSIA.	Gold.	3	1.545	7½ or	3.86	15	.076		
		5	2.575	½ Impl.		20	.10	1	.0075
		10	5.15	10	5.15	25	.125	2	.015
		25	12.875	15 or	7.72	50	.25	5	.0375
100 Kopecks = 1 Ruble.	Ruble: $0.515	50	25.75	1 Impl.		100	.50		
		100	51.40			Ruble.			
		500	257.50			½	.25		
						1	.50		
		Peseta.	$	Doubl'n	$	Peseta.	$	bronze.	$
SPAIN.	Gold.			1-16	0.95				
				⅛	1.90				
				¼	3.83	1	.174		
		25	4.825	½	7.75	2	.348		
100 Centimos = 1 Peseta.	Peseta: $0.19	50	9.65	1	15.50	5	.87	Centimo.	
		100	19.30	Peseta.				1	.00175
		500	96.50	5	.965	Centimo	$	2	.0035
		1,000	193.00	10	1.93	50	.087	5	.00875
				20	3.86				
				25	4.825				

SWITZERLAND.—The monetary system of SWITZERLAND is the same as that of France, its coins bearing also the same names.

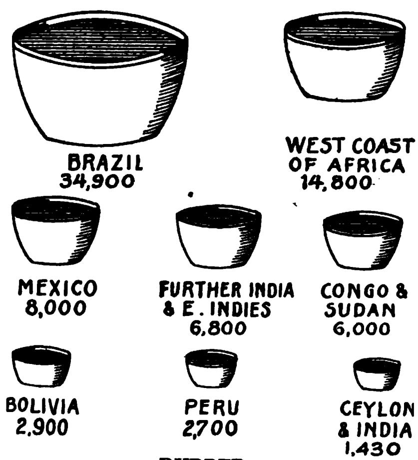
NOTE. FRANCE.—Belgian, Swiss, Austrian, Russian, Spanish, Italian and Servian gold pieces and Belgian, Swiss and Greek silver coins are current in France. Five Lire Italian pieces are also current, but not Italian silver of lower values.

Copper coins of foreign countries do not circulate in France.

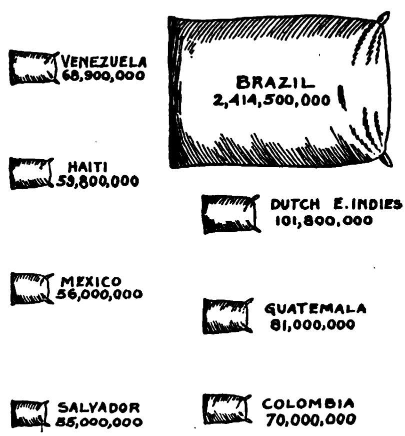
CAUTION.—Do not take any bad money.

The following coins which are uncurrent in France, and worth only their metal value, are frequently offered tourists [in change by cabmen and others. Tourists will do well to examine silver change received and reject such coins, viz.: French silver coins below the value of 5 Fcs. minted prior to 1863, and Spanish, South American and Papal silver coins regardless of denomination.

PRINCIPAL STEAMSHIP ROUTES FROM ASIA.



RUBBER.
A YEAR'S PRODUCTION.
(in tons.)



COFFEE.
ONE YEAR'S PRODUCTION.
(in lbs.)

VALUE OF FOREIGN COINS July 1, 1913.

COUNTRY.	Legal standard.	Monetary unit.	Value in terms of U. S. money.
Argentine Republic	Gold	Peso	$0.9647
Austria-Hungary	Gold	Crown	.203
Belgium	Gold and silver	Franc	.193
Bolivia	Gold	Boliviano	.389
Brazil	Gold	Milreis	.546
British Colonies in Australasia and Africa.	Gold	Pound sterling	4.8665
Canada	Gold	Dollar	1.000
Central Amer. States:			
Costa Rica	Gold	Colon	.465
British Honduras	Gold	Dollar	1.000
Guatemala, Honduras, Nicaragua, Salvador	Silver	Peso	.436
Chile	Gold	Peso	.365
China	Silver	Tael: Amoy	.715
		Canton	.713
		Cheefoo	.683
		Chin Kiang	.698
		Fuchau	.661
		Haikwan (Customs).	.727
		Hankow	.669
		Kiaochow	.692
		Nankin	.707
		Niuchwang	.670
		Ningpo	.687
		Peking	.697
		Shanghai	.653
		Swatow	.660
		Takau	.719
		Tientsin	.692
		Dollar: Yuan	.520
		Dollar: Hongkong	.470
		British	.470
		Mexican	.473
Colombia	Gold	Dollar	1.000

COUNTRY.	Legal standard.	Monetary unit.	Value in terms of U. S. money.
Denmark	Gold	Crown	.268
Ecuador	Gold	Sucre	.487
Egypt	Gold	Pound (100 piasters)	4.943
Finland	Gold	Mark	.193
France	Gold and silver	Franc	.193
German Empire	Gold	Mark	.238
Great Britain	Gold	Pound sterling	4.8665
Greece	Gold and silver	Drachma	.193
Haiti	Gold	Gourde	.965
India [British]	Gold	Rupee	.3244⅓
Italy	Gold and silver	Lira	.193
Japan	Gold	Yen	.498
Liberia	Gold	Dollar	1.000
Mexico	Gold	Peso	.498
Netherlands	Gold	Florin	.402
Newfoundland	Gold	Dollar	1.014
Norway	Gold	Crown	.268
Panama	Gold	Balboa	1.000
Paraguay	Silver	Peso	.436
Persia	Gold and silver	Kran	.1704
Peru	Gold	Libra	4.8665
Philippine Islands	Gold	Peso	.500
Portugal	Gold	Milreis	1.080
Roumania	Gold	Leu	.193
Russia	Gold	Ruble	.515
Santo Domingo	Gold	Dollar	1.000
Servia	Gold	Dinar	.193
Siam	Gold	Tical	.3708
Spain	Gold and silver	Peseta	.193
Straits Settlements	Gold	Dollar	.5677
Sweden	Gold	Crown	.268
Switzerland	Gold	Franc	.193
Turkey	Gold	Piaster	.044
Uruguay	Gold	Peso	1.034
Venezuela	Gold	Bolivar	.193

HIGHEST AND LOWEST ALTITUDES IN UNITED STATES.

State.	Highest Point. Name.	Highest Point. Elevation (feet).	Lowest Point. Name.	Lowest Point. Elevation (feet).	Approximate Mean Elevation (feet).
Alabama	Cheaha Mountain	2,407	Gulf of Mexico	Sea level	500
Alaska	Mount McKinley	20,300	Pacific Ocean	Sea level	....
Arizona	San Francisco Peak	12,611	Colorado River	100	4,100
Arkansas	Blue Mountain Magazine Mountain	2,800 2,800	Ouachita River	55	650
California	Mount Whitney	14,501	Death Valley	276 (below sea level)	2,900
Colorado	Mount Massive Mount Elbert	14,402 14,402	Arkansas River	3,350	6,800
Connecticut	Bear Mountain	2,355	Long Island Sound	Sea level	500
Delaware	Centerville	440	Atlantic Ocean	Sea level	60
District of Columbia	Tenley	420	Potomac River	Sea level	150
Florida	Mount Pleasant	301	Atlantic Ocean	Sea level	100
Georgia	Brasstown Bald	4,768	do	Sea level	600
Guam	Mount Jumullong Manglo	1,274	Pacific Ocean	Sea level	....
Hawaii	Mauna Kea	13,823	do	Sea level	....
Idaho	Hyndman Peak	12,078	Snake River	720	5,000
Illinois	Charles Mound	1,241	Mississippi River	279	600
Indiana	Carlos	1,210	Ohio River	316	700
Iowa	Primghar	1,800	Mississippi River	477	1,100
Kansas	On west boundary	4,135	Verdigris River	700	2,000
Kentucky	Big Black Mountain	4,100	Mississippi River	257	750
Louisiana	Northwest part of county	400	Gulf of Mexico	Sea level	100
Maine	Mount Katahdin	5,200	Atlantic Ocean	Sea level	600
Maryland	Backbone Mountain	3,340	do	Sea level	350
Massachusetts	Mount Greylock	3,505	do	Sea level	500
Michigan	Porcupine Mountains	2,023	Lake Erie	573	900
Minnesota	Mesabi Range	1,920	Lake Superior	602	1,200
Mississippi	Holly Springs	600	Gulf of Mexico	Sea level	300
Missouri	Taum Sauk Mountain	1,750	St. Francis River	210	800
Montana	Granite Peak	12,850	Kootenai River	1,800	3,400
Nebraska	Southwest part of county	5,350	Southeast corner of State	825	2,600
Nevada	Wheeler Peak	13,058	Colorado River	470	5,500
New Hampshire	Mount Washington	6,293	Atlantic Ocean	Sea level	1,000
New Jersey	High Point	1,809	Atlantic Ocean	Sea level	250
New Mexico	North Truchas Peak	13,306	Red Bluff	2,876	5,700
New York	Mount Marcy	5,344	Atlantic Ocean	Sea level	900
North Carolina	Mount Mitchell	6,711	do	Sea level	700
North Dakota	Summit of county	3,500	Pembina	790	1,900
Ohio	Near Mansfield	1,479	Ohio River	425	850
Oklahoma	West end of county	4,750	Red River	300	1,300
Oregon	Mount Hood	11,225	Pacific Ocean	Sea level	3,300
Pennsylvania	Blue Knob	3,136	Delaware River	Sea level	1,100
Philippine Islands	Mount Apo	9,610	Pacific Ocean	Sea level	....
Porto Rico	Luquillo Mountains	3,532	Atlantic Ocean	Sea level	....
Rhode Island	Durfee Hill	805	Atlantic Ocean	Sea level	200
South Carolina	Sassafras Mountain	3,548	do	Sea level	350
South Dakota	Harney Peak	7,242	Big Stone Lake	962	2,200
Tennessee	Mount Guyot	6,636	Mississippi River	182	900
Texas	El Capitan	9,020	Gulf of Mexico	Sea level	1,700
Utah	Kings Peaks	13,498	Beaverdam Creek	2,000	6,100
Vermont	Mount Mansfield	4,364	Lake Champlain	95	1,000
Virginia	Mount Rogers	5,719	Atlantic Ocean	Sea level	950
Washington	Mount Rainier	14,363	Pacific Ocean	Sea level	1,700
West Virginia	Spruce Knob	4,860	Potomac River	240	1,500
Wisconsin	Rib Hill	1,940	Lake Michigan	582	1,050
Wyoming	Gannett Peak	13,785	Belle Fourche River	3,100	6,700
United States (exclusive of Alaska).	Mount Whitney	14,501	Death Valley	276 (below sea level)	2,500

U. S. Geological Survey.

Customs and Internal Revenue Collected on Distilled Spirits, Wines, Malt Liquors and Tobacco with Total National Revenue and Percentage.

For the fiscal year ending June 30, 1912, the total national ordinary receipts from all sources amounted to $691,778,465, and the total internal revenue and customs receipts from alcoholic beverages and tobacco and the manufactures of same amounted to $332,-497,000, or in other words, the receipts from alcoholic beverages and tobacco was 48.06 per cent. of the total revenue of the United States.

The customs revenue from alcoholic beverages, amounting to $16,765,000 was divided as follows: From malt liquors, $2,014,000; from wine, $5,809,000; from distilled spirits, $8,942,000. The customs revenue from tobacco and the manufactures of same amounted to $25,572,000. The internal revenue from alcoholic beverages, exclusive of license duties, which for the manufacture of malt liquors and distilled spirits amounted to $484,000, and for the sale of malt liquors and distilled spirits to $7,134,000, totaling $212,142,000, was divided as follows: From malt liquors, $62,108,000; and from distilled spirits, $149,-934,000. The internal revenue from tobacco amounted to $70,590,000. Thus for the year the total internal revenue and customs receipts from alcoholic beverages amounted to $236,335,000, and from tobacco and the manufacture of same $96,162,000.

Domestic Express Rates.

It is impossible in the space allotted to the subject to give an accurate idea of domestic express rates. However, the matter will be greatly simplified if the rates based on a zone system, as advocated by the Interstate Commerce Commission, are put into effect. The introduction of the Parcels Post has caused a material reduction in the present rates and tariffs.

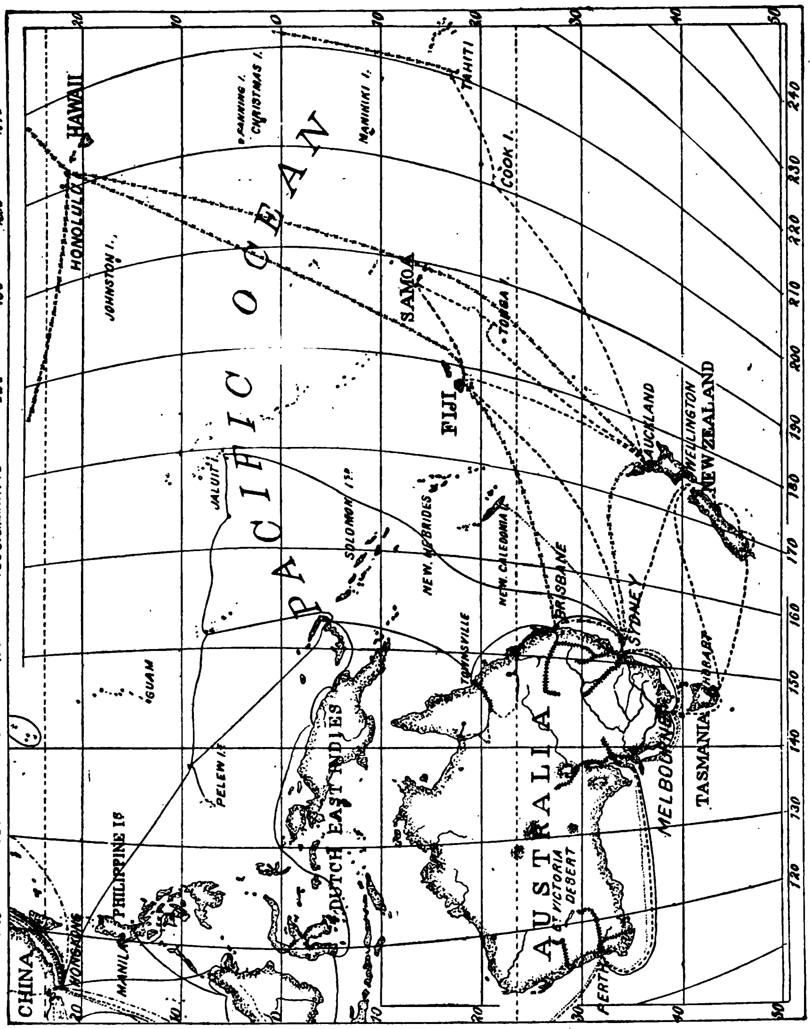
Foreign Express Rates.

The following is a tariff of all rates for express packages. It should be remembered that rates of this kind are subject to change without notice, and they are published solely in the interests of the shipper. These rates may be considered to be maximum. Thus we find another company offering shippings to Italy as low as 40 cents a single pound to Genoa, 60 cents to Rome, and 65 cents to other railway stations. Also a rate of 30 cents a pound to Paris and 25 cents a pound for shipments to London, via Southampton. The rates on say a hundred pounds do not vary in quite the same ratio. It is believed that with this tariff of rates the intending traveler can make his arrangements as to shipping packages of guide books, etc., rather more intelligently than without it. Rates to South Africa, North Africa, Asia, India, Japan, Australia, the West Indies, Porto Rico, Central America and South America are not included, as these rates vary so radically that it is impossible to get any accurate idea of what the shipment would actually cost without the publication of a more extensive table than space will permit.

OCEAN EXPRESS TARIFF FOR SMALL SHIPMENTS

EXPRESS RATES FROM NEW YORK OR BOSTON TO THE FOLLOWING PLACES:	lb. 1	lbs. 2	lbs. 4	lbs. 6	lbs. 8	lbs. 10	lbs. 20	lbs. 30	lbs. 40	lbs. 50	lbs. 60	lbs. 70	lbs. 80	lbs. 90	lbs. 100	Each Additional 20 pounds.	Value Rate per $100.	Insurance Rate per $100.
Liverpool, Havre, Hamburg, Bremen, Antwerp, Rotterdam, and London via Southampton	.30	.35	.45	.55	.65	.75	.90	1.20	1.50	1.70	1.90	2.10	2.30	2.40	2.50	.30	.40	.30
London, via Liverpool	.35	.40	.50	.60	.70	.80	1.20	1.80	2.20	2.50	2.70	2.90	3.10	3.30	3.50	.40	.50	.35
Paris, Berlin and Genoa	.35	.40	.50	.70	.90	1.00	1.40	1.90	2.40	2.80	3.00	3.20	3.40	3.70	4.00	.45	.50	.35
England, Ireland, Scotland, and Wales	.40	.45	.55	.65	.75	.90	1.20	1.80	2.20	2.50	2.70	2.90	3.10	.340	3.60	.45	.50	.40
France and Germany*	.50	.60	.80	1.00	1.20	1.40	2.00	2.50	3.00	3.30	3.60	3.80	4.00	4.30	4.50	.50	.50	.40
Holland and Belgium*	.40	.45	.55	.65	.75	.90	1.30	1.80	2.10	2.40	2.60	2.80	3.10	3.20	3.40	.40	.50	.50
Norway and Denmark*	.45	.50	.70	.90	1.10	1.30	1.90	2.50	2.60	3.00	3.20	3.40	3.70	3.90	4.20	.45	.75	.40
Sweden*	.45	.50	.70	.90	1.30	1.60	2.50	3.20	3.50	3.60	4.00	4.20	4.50	4.70	4.90	.50	.75	.60
Austria, Hungary and Switzerland*	.60	.70	1.00	.120	1.40	1.60	1.90	2.20	2.80	3.20	3.50	4.00	4.50	5.00	5.20	.50	.75	.55
Russia, Turkey and Greece*	1.50	1.90	2.40	2.60	2.80	3.00	3.80	4.20	4.80	5.20	5.60	6.00	6.20	6.40	6.50	.65	1.75	.90
Italy, Spain, Portugal, Gibraltar, Malta*	.70	.75	.90	1.10	1.30	1.50	2.70	3.30	3.80	4.20	4.60	4.80	5.00	5.20	5.40	.55	1.25	.70

The above rates are figured to cover a thoroughly first class express service. *All towns where there is a R. R. Station.



PRINCIPAL STEAMSHIP ROUTES FROM AUSTRALASIA.

INTERNATIONAL UNION FOR THE PUBLICATION OF CUSTOMS TARIFFS.

The International Union for the Publication of Customs Tariffs was founded by an international convention, July 5, 1890, and concluded between fifty-two states and semi-independent colonies. The object of the union is to publish as promptly and as correctly as possible all the tariffs of the world in five languages, viz., English, French, German, Italian, and Spanish. The bureau has its seat at Brussels, and is under the direct control of the Government of Belgium. The members of the bureau are delegates from the principal countries whose language is used in the publications.

Monetary systems and approximate stocks of money, in the aggregate and

	Countries.	Monetary standard.	Monetary unit.	Population.	Stock of gold.		
					In banks and public treasuries.	In circulation.	Total.
				Thousands.	*Thousands.*	*Thousands.*	*Thousands.*
1	United States	Gold	Dollar	94,800	1,429,800	369,800	1,799,600
2	Austria-Hungary	do	Crown	49,400	265,700	90,600	356,300
3	Belgium	do	Franc	7,300	36,500		
4	British Empire:						
5	Australia	do	Pound sterling	4,400	207,800	14,600	222,400
6	Canada	do	Dollar	6,200	138,200		
7	United Kingdom.	do	Pound sterling	45,000	[1] 375,000	335,800	[1] 710,800
8	India	do	Pound sterling and rupee.	295,000	[2] 44,600		
9	South Africa	do	Pound sterling	7,800	50,400	15,000	65,400
10	Straits Settlements.[3]	do	Dollar	1,600	6,800		
11	Bulgaria	do	Lev	4,600	7,700		
12	Cuba	do	Peseta	2,100			42,000
13	Denmark	do	Crown	2,700	19,800	18,500	38,300
14	Egypt	do	Piaster	11,300	8,200	174,500	[4] 182,700
15	Finland	do	Markkaa	2,900	6,900	3,700	10,600
16	France	do	Franc	39,300	635,000	565,000	[5] 1,200,000
17	Germany	do	Mark	64,900	[6] 205,700		
18	Greece	do	Drachma	2,600	2,500	1,900	4,400
19	Haiti	do	Gourde	1,500	1,300	2,100	3,400
20	Italy	do	Lira	33,900	288,500		
21	Japan	do	Yen	52,200	117,000	16,900	133,900
22	Mexico	do	Peso	15,000	31,200		
23	Netherlands	do	Florin	5,900	56,400	19,200	75,600
24	Norway	do	Crown	2,400	16,200	4,600	20,800
25	Portugal	do	Milreis	5,400	6,500	8,000	14,500
26	Roumania	do	Lei	6,800	30,600	2,100	32,700
27	Russia	do	Ruble	160,100	611,700	334,600	946,300
28	Servia	do	Dinar	2,800	6,500		
29	Siam	do	Tical	7,000	100		
30	South American States:						
31	Argentina	do	Peso	7,000	248,300		
32	Bolivia	do	Boliviano	2,300	7,800		
33	Brazil	do	Milreis	20,500	116,500		
34	Chile	do	Peso	3,500	500		
35	Colombia	do	Dollar	4,300			
36	Ecuador	do	Sucre	1,500	3,300	2,100	5,400
37	Guiana—						
38	British	do	Pound sterling	300	100		
39	Dutch	do	Florin	100	200		
40	French	do	Franc	100	100		
41	Paraguay	do	Peso	800	15,200		
42	Peru	do	Sol	4,500	8,300	3,900	12,200
43	Uruguay	do	Peso	1,100	15,200		
44	Venezuela	do	Bolivar	2,600	600	2,500	3,100
45	Spain	do	Peseta	19,700	74,900	138,200	213,100
46	Sweden	do	Crown	5,400	22,800	3,200	26,000
47	Switzerland	do	Franc	3,300	31,000	34,700	65,700
48	Turkey	do	Piaster	24,000	14,900	127,500	142,400
49	Central American States.	Silver [9]	Peso	5,300	1,300	100	1,400
	Total			1,040,600	5,167,600		

NOTE.—The blank spaces in this table signify that no satisfactory information is available.

[1] Estimates for the United Kingdom prior to that for 1910 were for coin only; these figures include $100,000,000 for bullion in the Bank of England; also $12,200,000 gold belonging to Indian gold-standard reserve.

[2] This is the amount in the currency reserves. Fred. J. Atkinson, accountant general of India, in 1908, estimated the active rupee circulation at 2,040,000,000 rupees; small silver coin at 140,000,000 rupees.

[3] Includes Straits Settlements, the Malay States, and Johore.

[4] This estimate is based upon a calculation made by Messrs. P. Arminjon and B. Michel in 1908, who estimated the stock of gold in the country at from 33,000,000 to 41,000,000 Egyptian pounds. The mean

per capita, in the principal countries of the world, Dec. 31, 1911.

Stock of silver.			Uncovered paper.	Per capita.				
Full tender.	Limited tender.	Total.		Gold.	Silver.	Paper.	Total.	
Thousands.	*Thousands.*	*Thousands.*	*Thousands.*					
568,300	167,600	735,900	764,500	$18.98	$7.76	$8.07	$34.81	1
Nil.	122,900	122,900	197,600	7.21	2.49	4.00	13.70	2
8,700	2,400	11,100	139,000	5.00	1.52	19.04	25.56	3
								4
Nil.	10,000	10,000	....	50.54	2.27	....	52.81	5
Nil.	7,700	7,700	79,100	22.29	1.24	12.76	36.29	6
Nil.	116,800	116,800	115,200	15.80	2.59	2.56	20.95	7
97,400	45,000	142,400	45,400	.14	.48	.16	.78	8
Nil.	20,000	20,000	....	8.38	2.56	....	10.94	9
Nil.	19,000	19,000	7,500	4.25	11.88	4.68	20.81	10
Nil.	4,800	4,800	9,900	1.93	1.20	2.47	5.60	11
Nil.	5,000	5,000	....	20.00	2.38	....	22.38	12
Nil.	7,900	7,900	17,300	14.19	2.92	6.41	23.52	13
Nil.	14,300	14,300	6,600	16.17	1.26	.58	18.01	14
Nil.	500	500	14,900	3.66	.17	5.13	8.96	15
347,400	63,700	411,100	245,900	30.53	10.46	6.26	47.25	16
Nil.	253,600	253,600	276,100	3.16	3.90	4.24	11,30	17
Nil.	3,000	3,000	27,600	1.69	1.15	10.62	13.46	18
1,000	1,500	2,500	8,200	2.26	1.67	5.47	9.40	19
22,700	1,400	24,100	182,300	8.51	.71	5.38	14.60	20
Nil.	64,200	64,200	101,700	2.57	1.23	1.95	5.55	21
52,000	4,000	56,000	51,200	2.08	3.73	3.41	9.22	22
Nil.	29,000	29,000	64,700	12.81	4.92	10.97	28.70	23
Nil.	3,700	3,700	8,700	8.67	1.54	3.62	13.83	24
Nil.	33,100	33,100	69,900	2.69	6.13	12.94	21.76	25
Nil.	12,600	12,600	43,200	4.81	1.85	6.35	18.01	26
Nil.	78,800	78,800	....	5.91	.49	....	6.40	27
Nil.	1,300	1,300	4,900	2.32	.46	1.75	4.53	28
Nil.	52,200	52,200	2,100	.01	7.46	.30	7.77	29
								30
Nil.	9,400	9,400	[7] 692,200	35.47	1.34	98.89	135.70	31
Nil.	700	700	2,000	3.39	.30	.87	4.56	32
Nil.	25,000	25,000	[7] 77,900	5,68	1.22	3.80	10.70	33
Nil.	8,500	8,500	19,000	.14	2.43	5.43	8.00	34
Nil.	....	....	[8] 10,000	....	....	2.33	2.33	35
Nil.	1,300	1,300	1,700	3.60	.87	1.13	5.60	36
								37
Nil.	400	400	100	.33	1.34	.33	2.00	38
Nil.	300	300	300	2.00	3.00	3.00	8.00	39
Nil.	100	100	600	1.00	1.00	6.00	8.00	40
Nil.	....	....	42,900	19.00	....	53.63	72.63	41
Nil.	2,400	2,400	....	2.71	.53	....	3.24	42
Nil.	4,300	4,300	8,000	13.82	3.90	7.28	25.00	43
Nil.	10,800	10,800	800	1.19	4.15	.31	5.65	44
Nil.	256,800	256,800	76,000	10.82	13.04	3.85	27.71	45
Nil.	8,600	8,600	34,700	4.81	1.59	6.43	12.83	46
Nil.	13,500	13,500	27,900	19.91	4.09	8.45	32.45	47
Nil.	26,400	26,400	....	5.93	1.10	....	7.03	48
Nil.	9,200	9,200	89,900	.26	1.74	16.96	18.96	49
1,097,500	1,523,700	2,621,200	3,567,500	....	....	....	....	

of these figures was adopted in this table last year. Since their estimate was made the net imports of gold into Egypt to Dec. 31, 1911, have amounted to $28,919,061, but as there is said to be a considerable absorption of gold for ornaments, no change in the estimate of the monetary stock has been made.

[5] Estimate of A. De Foville, 1909.

[6] German war fund and Imperial Bank of Germany. No definite information as to other holdings. The coinage of gold since the establishment of the Empire, less recoinage, amounts to $1,125,023,299, but the exports are unknown, and there has been an industrial consumption.

[7] Gold conversion value.

[8] This amount has been reduced to a gold basis; that is, 100 pesos equal 1 United States gold dollar.

[9] Except Costa Rica and British Honduras (gold-standard countries).

INTEREST TABLES.

SIMPLE INTEREST.*

Time.		1 day.	2 days.	3 days.	4 days.	5 days.	6 days.	7 days.	8 days.	9 days.	10 days.	20 days.	1 mo.	2 mos.	3 mos.	4 mos.	5 mos.	6 mos.	1 year.
Amt.	Int.																		
$1.....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	1	2	4
	5	....	....	....	....	....	....	....	....	....	....	....	....	1	1	2	2	3	5
	6	....	....	....	....	....	....	....	....	....	....	....	1	1	1	2	2	3	6
	7	....	....	....	....	....	....	....	....	....	....	....	1	1	1	2	3	4	7
$2.....	4	....	....	....	....	....	....	....	....	....	....	1	1	1	2	2	3	4	8
	5	....	....	....	....	....	....	....	....	....	....	1	1	2	3	3	4	5	10
	6	....	....	....	....	....	....	....	....	....	....	1	1	2	3	4	5	6	12
	7	....	....	....	....	....	....	....	....	....	....	1	1	2	4	5	6	7	14
$3.....	4	....	....	....	....	....	....	....	....	....	....	....	1	2	3	4	5	6	12
	5	....	....	....	....	....	....	....	....	....	....	1	1	3	4	5	6	8	15
	6	....	....	....	....	....	....	....	....	....	1	1	2	3	5	6	8	9	18
	7	....	....	....	....	....	....	....	....	1	1	1	2	4	5	7	9	11	21
$4.....	4	....	....	....	....	....	....	....	....	....	....	1	1	2	4	5	6	8	16
	5	....	....	....	....	....	....	....	....	1	1	1	2	3	5	7	8	10	20
	6	....	....	....	....	....	....	....	1	1	1	1	2	4	6	8	10	12	24
	7	....	....	....	....	....	....	1	1	1	1	2	2	5	7	9	12	14	28
$5.....	4	....	....	....	....	....	....	....	....	1	1	1	1	3	5	6	8	10	20
	5	....	....	....	....	....	....	....	1	1	1	1	2	4	6	8	10	13	25
	6	....	....	....	....	....	1	1	1	1	1	2	3	5	8	10	13	15	30
	7	....	....	....	....	....	1	1	1	1	1	2	3	6	9	12	15	18	35
$10....	4	....	....	....	....	....	1	1	1	1	1	2	3	6	10	13	16	20	40
	5	....	....	....	....	1	1	1	1	2	2	3	4	8	13	17	21	25	50
	6	....	....	1	1	1	1	1	2	2	2	3	5	10	15	20	25	30	60
	7	....	....	1	1	1	1	1	2	2	2	4	6	12	18	23	29	35	70
$25....	4	....	....	1	1	1	1	2	2	2	3	5	8	16	25	33	41	50	1.00
	5	....	1	1	2	2	2	2	3	3	3	7	10	21	31	42	52	63	1.25
	6	....	1	1	2	2	3	3	3	3	4	8	13	25	38	50	63	75	1.50
	7	....	1	1	2	2	3	3	4	4	5	10	15	29	44	58	73	88	1.75
$50....	4	....	1	1	2	3	3	4	4	5	6	11	16	33	50	67	83	1.00	2.00
	5	1	1	2	3	3	4	5	6	6	7	14	21	42	63	83	1.04	1.25	2.50
	6	1	2	3	3	4	5	6	7	8	8	17	25	50	75	1.00	1.25	1.50	3.00
	7	1	2	3	4	5	6	7	8	9	9	19	29	58	88	1.17	1.46	1.75	3.50
$100...	4	1	2	3	4	6	6	8	9	10	11	22	33	66	1.00	1.33	1.67	2.00	4.00
	5	1	3	4	6	7	8	10	11	13	14	28	42	83	1.25	1.67	2.08	2.50	5.00
	6	2	3	5	7	8	10	12	13	15	17	33	50	1.00	1.50	2.00	2.50	3.00	6.00
	7	2	4	6	8	10	12	14	16	18	19	39	58	1.17	1.75	2.33	2.92	3.50	7.00
$200...	4	2	4	6	9	11	13	15	18	20	22	44	67	1.33	2.00	2.66	3.33	4.00	8.00
	5	3	6	8	11	14	17	19	22	25	28	56	83	1.67	2.50	3.33	4.17	5.00	10.00
	6	3	7	10	13	17	20	23	27	30	33	67	1.00	2.00	3.00	4.00	5.00	6.00	12.00
	7	4	8	12	16	19	23	27	31	35	39	78	1.17	2.33	3.50	4.67	5.83	7.00	14.00
$300...	4	3	6	10	13	16	20	23	26	30	33	66	1.00	2.00	3.00	4.00	5.00	6.00	12.00
	5	4	8	13	17	21	25	29	33	38	42	83	1.25	2.50	3.75	5.00	6.25	7.50	15.00
	6	5	10	15	20	25	30	35	40	45	50	1.00	1.50	3.00	4.50	6.00	7.50	9.00	18.00
	7	6	12	18	23	29	35	41	47	53	58	1.17	1.75	3.50	5.25	7.00	8.75	10.50	21.00
$500...	4	5	11	16	22	28	33	39	44	50	56	1.11	1.66	3.33	5.00	6.66	8.33	10.00	20.00
	5	7	14	21	28	35	42	49	56	63	69	1.39	2.08	4.17	6.25	8.33	10.42	12.50	25.00
	6	8	17	25	33	42	50	58	67	75	83	1.67	2.50	5.00	7.50	10.00	12.50	15.00	30.00
	7	10	19	29	39	49	58	68	78	88	97	1.94	2.92	5.83	8.75	11.67	14.58	17.50	35.00
$1,000.	4	11	22	33	44	55	66	78	89	1.00	1.11	2.22	3.33	6.67	10.00	13.33	16.66	20.00	40.00
	5	14	28	42	56	69	83	97	1.11	1.25	1.39	2.78	4.17	8.33	12.50	16.67	20.83	25.00	50.00
	6	17	33	50	67	83	1.00	1.17	1.33	1.50	1.67	3.33	5.00	10.00	15.00	20.00	25.00	30.00	60.00
	7	19	39	58	78	97	1.17	1.36	1.56	1.75	1.94	3.89	5.83	11.67	17.50	23.33	29.17	35.00	70.00

*In order to find the amount of interest at 1 1-2, 2 1-2, 3 1-2 per cent, etc., divide the amount given at twice the interest (i. e., 3, 5, 7 per cent, etc.) by 2.

COMPOUND INTEREST TABLE NO. 1.

SHOWING THE RATE AT WHICH $1 WILL INCREASE WHEN AT COMPOUND INTEREST.

Years.	3%	4%	5%	6%	7%	Years.	3%	4%	5%	6%	7%
1	1.0300	1.0400	1.0500	1.0600	1.0700	11	1.3842	1.5394	1.7103	1.8983	2.1048
2	1.0609	1.0816	1.1025	1.1236	1.1449	12	1.4258	1.6010	1.7959	2.0122	2.2522
3	1.0927	1.1249	1.1576	1.1910	1.2250	13	1.4685	1.6650	1.8856	2.1329	2.4098
4	1.1255	1.1699	1.2155	1.2624	1.3108	14	1.5126	1.7316	1.9799	2.2609	2.5783
5	1.1592	1.2166	1.2763	1.3382	1.4025	15	1.5580	1.8009	2.0789	2.3966	2.7590
6	1.1940	1.2653	1.3401	1.4185	1.5007	16	1.6047	1.8730	2.1828	2.5403	2.9522
7	1.2299	1.3159	1.4071	1.5036	1.6058	17	1.6528	1.9480	2.2926	2.6928	3.1588
8	1.2668	1.3686	1.4774	1.5938	1.7182	18	1.7034	2.0258	2.4060	2.8513	3.3790
9	1.3048	1.4233	1.5513	1.6984	1.8384	19	1.7535	2.1068	2.5269	3.0256	3.6165
10	1.3439	1.4802	1.6289	1.7908	1.9671	20	1.8061	2.1911	2.6533	3.2071	3.8697

COMPOUND INTEREST TABLE NO. 2

SHOWING THE INCREASE OF $1 IF INVESTED AT COMPOUND INTEREST FOR 100 YEARS.

Investment.	Per Cent.	Amt. in 100 yrs.	Investment.	Per Cent.	Amount in 100 years.	Investment.	Per Cent.	Amt. in 100 yrs.	Investment.	Per Cent.	Amount in 100 years.
$1.......	1	$2.75	$1.......	5	$131.25	$1	9	$5,513.00	$1	15	$1,174,405.00
1.......	2	7.25	1.......	6	340.00	1	10	13,809.00	1	18	15,145,000.00
1.......	3	19.25	1.......	7	868.00	1	12	84,675.00	1	24	2,551,799,404.00
1.......	4	50.50	1.......	8	2,203.00						

YEARS IN WHICH MONEY WILL DOUBLE AT SEVERAL RATES OF INTEREST.

Rate of Int.	Simple Interest.	Compound Interest.	Rate of Int.	Simple Interest.	Compound Interest.
1 %	100 years	69 years and 245 days	5%	20 years	14 years and 75 days.
2 %	50 years	35 years	6%	16 years and 243 days.	11 years and 327 days.
2½%	40 years	28 years and 26 days	7%	14 years and 104 days.	10 years and 89 days.
3 %	33 years and 4 months	23 years and 164 days	8%	12 years and 183 days.	9 years and 2 days.
3½%	28 years and 208 days.	20 years and 54 days	9%	11 years and 40 days	8 years and 16 days.
4 %	25 years	17 years and 246 days	10%	10 years	7 years and 100 days.
4½%	22 years and 81 days.	15 years and 273 days			

TABLES OF WAGE.

MONTHLY WAGE TABLE.

Days	$10	$11	$12	$13	$14	$15	$16	$17	$18	$19	$20
1	.38	.42	.46	.50	.54	.58	.62	.65	.69	.73	.77
2	.77	.85	.92	1.00	1.08	1.15	1.23	1.31	1.38	1.46	1.54
3	1.15	1.27	1.38	1.50	1.62	1.73	1.85	1.96	2.08	2.19	2.31
4	1.54	1.69	1.85	2.00	2.15	2.31	2.46	2.62	2.77	2.92	3.08
5	1.92	2.12	2.31	2.50	2.69	2.88	3.08	3.27	3.46	3.65	3.85
6	2.31	2.54	2.77	3.00	3.23	3.46	3.69	3.92	4.15	4.38	4.62
7	2.69	2.96	3.23	3.50	3.77	4.04	4.31	4.58	4.85	5.12	5.38
8	3.08	3.38	3.69	4.00	4.31	4.62	4.92	5.23	5.54	5.85	6.15
9	3.46	3.81	4.15	4.50	4.85	5.19	5.54	5.88	6.23	6.58	6.92
10	3.85	4.23	4.62	5.00	5.38	5.77	6.15	6.54	6.92	7.31	7.69
11	4.23	4.65	5.08	5.50	5.92	6.35	6.77	7.19	7.62	8.04	8.46
12	4.62	5.08	5.44	6.00	6.46	6.92	7.38	7.85	8.31	8.77	9.23
13	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00
14	5.38	5.92	6.46	7.00	7.54	8.08	8.62	9.15	9.69	10.23	10.77
15	5.77	6.35	6.92	7.50	8.08	8.65	9.23	9.81	10.38	10.96	11.54
16	6.15	6.77	7.38	8.00	8.62	9.23	9.85	10.46	11.08	11.69	12.31
17	6.54	7.19	7.85	8.50	9.15	9.81	10.46	11.12	11.77	12.42	13.08
18	6.92	7.62	8.31	9.00	9.69	10.38	11.08	11.77	12.46	13.15	13.85
19	7.31	8.04	8.77	9.50	10.23	10.96	11.69	12.42	13.15	13.88	14.62
20	7.69	8.46	9.23	10.00	10.77	11.54	12.31	13.03	13.85	14.62	15.38
21	8.08	8.88	9.69	10.50	11.31	12.12	12.92	13.73	14.54	15.35	16.15
22	8.46	9.31	10.15	11.00	11.85	12.69	13.54	14.38	15.23	16.08	16.94
23	8.85	9.73	10.62	11.50	12.38	13.27	14.15	15.04	15.92	16.81	17.69
24	9.23	10.15	11.08	12.00	12.92	13.85	14.77	15.69	16.62	17.54	18.46
25	9.62	10.58	11.54	12.50	13.46	14.42	15.38	16.35	17.31	18.27	19.23
1 month	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00
2	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00	36.00	38.00	40.00
3	30.00	33.00	36.00	39.00	42.00	45.00	48.00	51.00	54.00	57.00	60.00
4	40.00	44.00	48.00	52.00	56.00	60.00	64.00	68.00	72.00	76.00	80.00
5	50.00	55.00	60.00	65.00	70.00	75.00	80.00	85.00	90.00	95.00	100.00
6	60.00	66.00	72.00	78.00	84.00	90.00	96.00	102.00	108.00	114.00	120.00
7	70.00	77.00	84.00	91.00	98.00	105.00	112.00	119.00	126.00	133.00	140 00
8	80.00	88.00	96.00	104.00	112.00	120.00	128.00	136.00	144.00	152.00	160.00
9	90.00	99.00	108.00	117.00	126.00	135.00	144.00	153.00	162.00	171.00	180.00
10	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00
11	110.00	121.00	132.00	143.00	154.00	165.00	176.00	187.00	198.00	209.00	220 00
1 year	120.00	132.00	144.00	156.00	168.00	180.00	192.00	204.00	216.00	228.00	240.00

YEARLY WAGE TABLE.

Per Year.	Per Month.	Per Week.	Per Day.	Per Year.	Per Month.	Per Week.	Per Day.	Per Year.	Per Month.	Per Week.	Per Day.
$20 is	$1.67	$0.38	$0.05	$100 is	$8.33	$1.92	$0.27	$180 is	$15.00	$3.45	$0.49
25	2.08	.48	.07	105	8.75	2.01	.29	185	15.42	3.55	.51
30	2.50	.58	.08	110	9.17	2.11	.30	190	15.83	3.64	.52
35	2.92	.67	.10	115	9.58	2.21	.32	195	16.25	3.74	.53
40	3.33	.77	.11	120	10.00	2.30	.33	200	16.57	3.84	.55
45	3.75	.86	.12	125	10.42	2.40	.34	205	17.08	3.93	.56
50	4.17	.96	.14	130	10.83	2.49	.36	210	17.50	4.03	.58
55	4.58	1.06	.15	135	11.25	2.59	.37	215	17.92	4.12	.59
60	5.00	1.15	.16	140	11.67	2.69	.38	220	18.33	4.22	.60
65	5.42	1.25	.18	145	12.08	2.78	.40	225	18.75	4.31	.62
70	5.83	1.34	.19	150	12.50	2.88	.41	230	19.17	4.41	.63
75	6.25	1.44	.21	155	12.92	2.97	.42	235	19.58	4.51	.64
80	6.67	1.53	.22	160	13.33	3.07	.44	240	20.00	4.60	.66
85	7.08	1.63	.23	165	13.75	3.16	.45	245	20.42	4.70	.67
90	7.50	1.73	.25	170	14.17	3.26	.47	250	20.83	4.79	.69
95	7.92	1.82	.26	175	14.58	3.36	.48				

WEEKLY WAGE TABLE.

Hours.	$1.00	$2.00	$3.00	$4.00	$5.00	$6.00	$7.00	$8.00	$9.00	$10.00	$11.00	$12.00	$13.00	$14.00
½	.01	.01⅔	.02½	.03⅓	.04⅓	.05	.06	.06⅔	.07½	.08⅓	.09	.10	.11	.12
1	.01⅔	.03⅓	.05	.06⅔	.08⅓	.10	.11⅔	.13⅓	.15	.16⅔	.18⅓	.20	.22	.23⅓
2	.03⅓	.06⅔	.10	.13⅓	.16⅔	.20	.23⅓	.26⅔	.30	.33⅓	.36⅔	.40	.43⅓	.46⅔
3	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70
4	.06⅔	.13⅓	.20	.26⅔	.33⅓	.40	.46⅔	.53⅓	.60	.66⅔	.73⅓	.80	.86⅔	.93⅓
5	.08⅓	.16⅔	.25	.33⅓	.41⅔	.50	.58⅓	.66⅔	.75	.83⅓	.91⅔	1.00	1.08⅓	1.16⅔
6	.10	.20	.30	.40	.50	.60	.70	.80	.90	1.00	1.10	1.20	1.30	1.40
7	.11⅔	.23⅓	.35	.46⅔	.58⅓	.70	.81⅔	.93⅓	1.05	1.16⅔	1.28⅓	1.40	1.52	1.63⅓
8	.13⅓	.26⅔	.40	.53⅓	.62⅔	.80	.93⅓	1.06⅔	1.20	1.33⅓	1.46⅔	1.60	1.73⅓	1.86⅔
Days.														
1	.16⅔	.33⅓	.50	.66⅔	.83⅓	1.00	1.16⅔	1 33⅓	1.50	1.66⅔	1.83⅓	2.00	2.17	2.33⅓
2	.33⅓	.66⅔	1.00	1.33⅓	1.66⅔	2.00	2.33⅓	2.66⅔	3.00	3.33⅓	3.66⅔	4.00	4.34	4.66⅔
3	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.51	6.99⅔
4	.66⅔	1.33⅓	2.00	2.66⅔	3.33⅓	4.00	4.66⅔	5.33⅓	6.00	6.66⅔	7.33⅓	8.00	8.68	9.83
5	.83⅓	1.66⅔	2.50	3.33⅓	4.16⅔	5.00	5.83⅓	6.66⅔	7.50	8.33⅔	9.16⅔	10.00	10.85	11.66⅓
6	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.60	13.00	14.00

Trade Discount Table

From the Business Man's Pocket Book, by permission of the owners of the copyright The International Text Book Company, proprietors of the International Correspondence Schools of Scranton, Pa.

Rate Per Cent.	Equivalent	Net	Rate Per Cent.	Equivalent	Net
2½	.0250	.9750	25 and 10	.3250	.6750
2½ and 2½	.0494	.9506	25, 10 and 2½	.3419	.6581
2½ and 5	.0738	.9262	25, 10, and 5	.3588	.6412
2½, 5, and 2½	.0969	.9031	25, 10, and 7½	.3756	.6244
2½, 5, and 5	.1201	.8799	25, 10, and 10	.3925	.6075
2½, 5, 5, and 2½	.1421	.8579	27½	.2750	.7250
2½ and 10	.1225	.8775	27½ and 2½	.2931	.7069
2½, 10 and 2½	.1444	.8556	27½, 2½, and 2½	.3108	.6892
2½, 10, and 5	.1660	.8340	27½ and 5	.3113	.6887
2½, 10, 5, and 2½	.1872	.8128	27½, 5, and 2½	.3285	.6715
2½, 10, and 10	.2103	.7897	27½, 5, and 5	.3457	.6543
5	.0500	.9500	27½ and 7½	.3294	.6706
5 and 2½	.0738	.9262	27½, 7½, and 2½	.3462	.6538
5 and 5	.0975	.9025	27½, 7½, and 5	.3629	.6371
5, 5, and 2½	.1201	.8799	27½, 7½, and 7½	.3797	.6203
5, 5, and 5	.1426	.8574	27½ and 10	.3475	.6525
5, 5, 5, and 2½	.1640	.8360	27½, 10, and 2½	.3638	.6362
10	.1000	.9000	27½, 10, and 5	.3801	.6199
10 and 2½	.1225	.8775	27½, 10, and 7½	.3964	.6036
10 and 5	.1450	.8550	27½, 10, and 10	.4128	.5872
10, 5, and 2½	.1664	.8336	30	.3000	.7000
10, 5, and 5	.1878	.8122	30 and 2½	.3175	.6825
10, 5, 5, and 2½	.2081	.7919	30, 2½, and 2½	.3346	.6654
10 and 10	.1900	.8100	30 and 5	.3350	.6650
10, 10, and 2½	.2103	.7897	30, 5, and 2½	.3516	.6484
10, 10, and 5	.2305	.7695	30, 5, and 5	.3683	.6317
10, 10, 5, and 2½	.2497	.7503	30 and 7½	.3525	.6475
10, 10, and 10	.2710	.7290	30, 7½, and 2½	.3687	.6313
15	.1500	.8500	30, 7½, and 5	.3849	.6151
15 and 2½	.1713	.8287	30, 7½, and 7½	.4011	.5989
15 and 5	.1925	.8075	30 and 10	.3700	.6300
15, 5, and 2½	.2127	.7873	30, 10, and 2½	.3858	.6142
15, 5, and 5	.2329	.7671	30, 10, and 5	.4015	.5985
15, 5, 5, and 2½	.2521	.7479	30, 10, and 7½	.4173	.5827
15 and 10	.2350	.7650	30, 10, and 10	.4330	.5670
15, 10, and 2½	.2541	.7459	32½	.3250	.6750
15, 10, and 5	.2733	.7267	32½ and 2½	.3419	.6581
15, 10, 5, and 2½	.2915	.7085	32½, 2½, and 2½	.3584	.6416
15, 10, and 10	.3115	.6885	32½ and 5	.3588	.6412
20	.2000	.8000	32½, 5, and 2½	.3748	.6252
20 and 2½	.2200	.7800	32½, 5, and 5	.3909	.6091
20 and 5	.2400	.7600	32½ and 7½	.3756	.6244
20, 5, and 2½	.2590	.7410	32½, 7½, and 2½	.3912	6088
20, 5, and 5	.2780	.7220	32½, 7½, and 5	.4068	.5932
20, 5, 5, and 2½	.2962	.7038	32½, 7½, and 7½	.4224	.5776
20 and 10	.2800	.7200	32½ and 10	.3925	.6075
20, 10, and 2½	.2980	.7020	32½, 10, and 2½	.4077	.5923
20, 10, and 5	.3160	.6840	32½, 10, and 5	.4229	.5771
20, 10, 5, and 2½	.3331	.6669	32½, 10, and 7½	.4381	.5619
20, 10 and 10	.3520	.6480	32½, 10, and 10	.4533	.5467
25	.2500	.7500	35	.3500	.6500
25 and 2½	.2688	.7312	35 and 2½	.3663	.6337
25, 2½, and 2½	.2871	.7129	35, 2½, and 2½	.3821	.6179
25 and 5	.2875	.7125	35 and 5	.3825	.6175
25, 5, and 2½	.3053	.6947	35, 5, and 2½	.3979	.6021
25, 5, and 5	.3231	.6769	35, 5, and 5	.4134	.5866
25 and 7½	.3063	.6937	35 and 7½	.3988	.6012
25, 7½ and 2½	.3236	.6764	35, 7½, and 2½	.4138	.5862
25, 7½, and 5	.3410	.6590	35, 7½, and 5	.4288	.5712
25, 7½, and 7½	.3583	.6417	35, 7½, and 7½	.4439	.5561

Trade Discount Table—(Continued)

Rate Per Cent.	Equivalent	Net	Rate Per Cent.	Equivalent	Net
35 and 10	.4150	.5850	42½, 10, and 7½	.5213	.4787
35, 10, and 2½	.4296	.5704	42½, 10 and 10	.5343	.4657
35, 10, and 5	.4443	.5557	45	.4500	.5500
35, 10, and 7½	.4589	.5411	45 and 2½	.4638	.5362
35, 10, and 10	.4735	.5265	45, 2½, and 2½	.4772	.5228
37½	.3750	.6250	45 and 5	.4775	.5225
37½ and 2½	.3906	6094	45, 5, and 2½	.4906	.5094
37½, 2½, and 2½	.4058	.5942	45, 5, and 5	.5036	.4964
37½ and 5	.4063	.5937	45 and 7½	.4913	.5087
37½, 5, and 2½	.4211	.5789	45, 7½, and 2½	.5040	4960
37½, 5, and 5	.4360	.5640	45, 7½, and 5	.5167	.4833
37½ and 7½	.4219	.5781	45, 7½, and 7½	.5295	.4705
37½, 7½, and 2½	.4364	.5636	45 and 10	.5050	.4950
37½, 7½, and 5	.4508	.5492	45, 10, and 2½	.5174	.4826
37½, 7½, and 7½	.4654	.5346	45, 10, and 5	.5298	.4702
37½ and 10	.4375	.5625	45, 10, and 7½	.5421	.4579
37½, 10, and 2½	.4516	.5484	45, 10, and 10	.5545	.4455
37½, 10, and 5	.4656	.5344	47½	.4750	.5250
37½, 10, and 7½	.4797	.5203	47½ and 2½	.4881	.5119
37½, 10, and 10	.4938	.5062	47½, 2½, and 2½	.5009	.4991
40	.4000	.6000	47½ and 5	.5013	.4987
40 and 2½	.4150	.5850	47½, 5, and 2½	.5138	.4862
40, 2½, and 2½	.4296	.5704	47½, 5 and 5	.5262	.4738
40 and 5	.4300	.5700	47½ and 7½	.5144	.4856
40, 5, and 2½	.4443	.5557	47½, 7½, and 2½	.5265	.4735
40, 5, and 5	.4585	.5415	47½ 7½, and 5	.5387	.4613
40 and 7½	.4450	.5550	47½, 7½, and 7½	.5509	.4491
40, 7½, and 2½	.4589	.5411	47½ and 10	.5275	.4725
40, 7½, and 5	.4728	.5272	47½, 10, and 2½	.5393	.4607
40, 7½, and 7½	.4866	.5134	47½, 10, and 5	.5511	.4489
40 and 10	.4600	.5400	47½, 10, and 7½	.5629	.4371
40, 10, and 2½	.4735	.5265	47½, 10, and 10	.5748	.4252
40, 10, and 5	.4870	.5130	50	.5000	.5000
40, 10, and 7½	.5005	.4995	50 and 2½	.5125	.4875
40, 10, and 10	.5140	.4860	50, 2½, and 2½	.5247	.4753
42½	.4250	.5750	50 and 5	.5250	.4750
42½ and 2½	.4394	.5606	50, 5, and 2½	.5369	.4631
42½, 2½, and 2½	.4534	.5466	50, 5, and 5	.5488	.4512
42½ and 5	.4538	.5462	50 and 7½	.5375	.4625
42½, 5, and 2½	.4675	.5325	50, 7½, and 2½	.5491	.4509
42½, 5, and 5	.4811	.5189	50, 7½, and 5	.5606	.4394
42½ and 7½	.4681	.5319	50, 7½, and 7½	.5722	.4278
42½, 7½, and 2½	.4814	.5186	50 and 10	.5500	.4500
42½, 7½, and 5	.4947	.5053	50, 10, and 2½	.5613	.4387
42½, 7½, and 7½	.5080	.4920	50, 10, and 5	.5725	.4275
42½ and 10	.4825	.5175	50, 10, and 7½	.5838	.4162
42½, 10, and 2½	.4954	.5046	50, 10, and 10	.5950	.4050
42½, 10, and 5	.5084	.4916			

THE SEVEN WONDERS OF THE WORLD.

ANCIENT

The Seven Wonders of the World, so-called, or rather the Seven Wonders of the Ancient World, were as follows: The Pharos of Alexandria; The Colossus of Rhodes; The Great Temple of Diana at Ephesus; The Hanging Gardens of Babylon; The Pyramids; The Tomb of Mausolus; and the Great Statue of Jupiter at Olympia. All of the Seven Wonders were situated on the shores of the eastern part of the Mediterranean. If the Greek writers had been better acquainted with the north of Europe or the south of Asia, they would probably have made a different selection.

MODERN

The Seven Wonders of the Modern World, according to the poll of a thousand scientists in America and Europe, are, in the order of importance, with the votes cast; Wireless telegraphy, 244 votes; telephone, 185; aeroplane, 167; radium, 165; spectrum analysis, 126; X-ray, 111. The Panama Canal was given 100 votes; anesthesia, 94, and synthetic chemistry, 81. Only one ballot, bearing the name of one of the most distinguished authorities on chemistry of Munich, Germany, was checked for the seven titles, while six ballots showed the selection of six of the final seven.

THE PHAROS OF ALEXANDRIA.

THE GREAT TEMPLE OF DIANA AT EPHESUS.

Courtesy of "The Sphere." THE COLOSSUS OF RHODES.

THE HANGING GARDENS OF BABYLON.

Courtesy of "The Sphere."

THE STATUE OF JUPITER AT OLYMPIA

THE TOMB OF MAUSOLUS.

Courtesy of "The Sphere."

THE PYRAMIDS OF EGYPT.

DEPARTMENT OF AGRICULTURE.

The Secretary of Agriculture exercises personal supervision of public business relating to the agricultural industry. He appoints all the officers and employees of the department with the exception of the Assistant Secretary and the Chief of the Weather Bureau, who are appointed by the President, and directs the management of all the bureaus, divisions, and offices embraced in the department. He exercises advisory supervision over agricultural experiment stations which receive aid from the National Treasury.

BUREAU OF ANIMAL INDUSTRY.

The Bureau of Animal Industry conducts the inspection of animals, meats, and meat-food products under the act of Congress of June 30, 1906, and has charge of the inspection of import and export animals. It makes special investigations in regard to dairy subjects.

FOREST SERVICE.

The Bureau of Forestry gives practical advice in the conservative handling of forest lands; investigates methods of forest planting, and gives practical advice to tree planters; investigates the control and prevention of forest fires, and other forest problems.

BUREAU OF CHEMISTRY.

The Bureau of Chemistry makes such investigations and analyses as pertain in general to the interests of agriculture, dealing with fertilizers and agricultural products. It inspects the conditions of manufacture, transportation, and sale of food and drug products for the purpose of determining whether such products are adulterated or misbranded within the meaning of the Pure Food and Drugs Act of June 30, 1906. Also inspects imported and exported food products.

BUREAU OF SOILS.

The Bureau of Soils has for its object the investigation of soils in their relation to crops, the mapping of soils, and the investigation, mapping, and reclamation of alkali lands.

BUREAU OF PLANT INDUSTRY.

The Bureau of Plant Industry studies plant life in all its relations to agriculture. It includes vegetable, pathological and physiological, botanical, pomological and grass and forage plant investigations.

BUREAU OF ENTOMOLOGY.

The Bureau of Entomology obtains and disseminates information regarding injurious insects affecting field crops, fruits, small fruits, and truck crops, forests and forest products, and stored products.

BUREAU OF BIOLOGICAL SURVEY.

The Bureau of Biological Survey investigates the economic relation of birds and mammals and recommends measures for the preservation of beneficial and the destruction of injurious species. It also studies the geographical distribution of animals and plants and maps the natural life zones of the country.

OFFICE OF EXPERIMENT STATIONS.

The Office of Experiment Stations represents the department in its relations with the agricultural colleges and experiment stations, which are now in operation in all the States, and directly manages the experiment stations in Alaska, Hawaii, Porto Rico, and Guam. It seeks to promote the interest of agricultural education and investigation throughout the United States.

CHAPTER VI.

MERCHANT MARINE.

NUMBER AND NET AND GROSS TONNAGE OF STEAM AND SAILING VESSELS OF OVER 100 TONS, OF THE SEVERAL COUNTRIES OF THE WORLD, AS RECORDED IN LLOYD'S REGISTER FOR 1913-14.

Flag.	Steam.			Sail.		Total.	
	Number.	*Net tons.*	*Gross tons.*	*Number.*	*Net tons.*	*Number.*	*Tonnage.*
British..........							
United King'm	8,514	11,109,560	18,273,944	700	422,293	9,214	18,696,237
Colonies......	1,495	915,950	1,575,223	578	160,083	2,073	1,735,306
Total.......	10,009	12,025,510	19,849,167	1,278	582,376	11,287	20,431,543
American (United States):							
Sea...........	1,209	1,280,958	1,971,903	1,487	1,026,554	2,696	2,998,457
Northern Lakes	593	1,724,566	2,285,836	34	96,854	627	2,382,690
Philippine Islands.....	69	27,080	44,555	8	1,934	77	46,489
Total.......	1,871	3,032,604	4,302,294	1,529	1,125,342	3,400	5,427,636
Argentinian.....	236	107,172	180,576	72	34,259	308	214,835
Austro-Hungarian	419	629,444	1,010,347	8	1,067	427	1,011,414
Belgian..........	164	186,581	296,196	8	8,190	172	304,386
Brazilian........	402	188,645	313,416	57	16,221	459	329,637
Chilian..........	95	68,834	108,491	36	31,301	131	139,792
Chinese..........	66	55,375	86,690	....	....	66	86,690
Cuban..........	55	37,902	60,895	4	641	59	61,536
Danish..........	552	415,880	711,094	259	50,960	811	762,054
Dutch..........	662	794,840	1,286,742	97	23,107	759	1,309,849
French..........	987	1,029,113	1,793,310	565	407,854	1,552	2,201,164
German..........	2,019	2,877,887	4,743,046	302	339,015	2,321	5,082,061
Greek..........	365	443,771	705,897	77	16,885	442	722,782
Haitian..........	5	2,017	3,387	....	....	5	3,387
Italian..........	591	773,848	1,274,127	523	247,815	1,114	1,521,942
Japanese........	1,037	956,702	1,500,014	....	....	1,037	1,500,014
Mexican.........	43	22,838	37,920	9	2,129	52	40,049
Norwegian.......	1,597	1,122,577	1,870,793	594	587,097	2,191	2,457,890
Peruvian........	20	13,352	25,814	40	19,700	60	45,514
Portuguese......	105	55,903	92,636	103	27,943	208	120,579
Roumanian......	32	25,011	45,123	1	285	33	45,408
Russian..........	716	463,022	790,075	500	184,103	1,216	974,178
Siamese..........	12	7,955	12,936	....	....	12	12,936
Spanish..........	547	506,073	826,261	60	14,734	607	840,995
Swedish.........	1,043	551,964	943,926	393	103,344	1,436	1,047,270
Turkish..........	135	65,402	111,848	137	45,450	272	157,298
Uruguayan......	50	38,360	62,215	15	13,316	65	75,531
Venezuelan......	8	2,420	4,232	5	679	13	4,911
Other countries: Bulgaria, Colombia, Costa Rica, Ecuador, Egypt, Honduras, Liberia, Montenegro, Nicaragua, Oman, Panama, Persia, Salvador Samos Sarawak Tunis, Zanzibar, etc.......	54	16,027	29,709	22	7,123	76	36,832
Total.......	23,897	26,517,029	43,079,177	6,694	3,890,936	30,591	46,970,113

For valuable information relative to ocean travel the reader is referred to "Scientific American Handbook of Travel," published by Munn & Co., Inc., and compiled and edited by Albert A. Hopkins. It is the standard book on the subject, and the tables, etc., in this Chapter bring it up to date.

MERCHANT MARINE OF THE UNITED STATES.

On June 30, 1912, the merchant marine of the United States, including all kinds of documented shipping, comprised 26,528 vessels of 7,714,183 gross tons. Of this number 16,874, having a gross tonnage 3,625,525, were operating on the Atlantic and Gulf coasts; 4,254 vessels, with a tonnage of 963,319, were operating on the Pacific Coast. The power and material of the total number of documented vessels were as follows: Sailing vessels—Wood, 7,442, gross tonnage 1,279,633; metal, 140, gross tons 259,214; total, 7,562, with a gross tonnage of 1,538,847. Of steam vessels, 12,192, having a tonnage of 1,111,905, were made of wood, and 2,073, with a tonnage of 4,067,593, were built of metal, making a total of 14,265 vessels, with a gross tonnage of 5,197,858. There are also 665 wooden canal boats having a tonnage of 72,567, and 3,842 wooden and 174 metal barges, having a tonnage of 922,911 tons. During the year 1,505 vessels, having a gross tonnage of 232,669 were constructed. Of this number 104 metal vessels had a tonnage of 135,881.

OCEAN STEAMERS, 16 KNOTS AND OVER. Number belonging to each Country.

Country.	20 knots & above.	19 knots.	18½ kts.	18 knots.	17½ kts.	17 knots.	16 knots.	Total.
Argentine	...	...	...	...	...	...	1	1
Austria	...	1	...	2	...	2	4	9
Belgium	...	...	...	...	...	1	1	2
Denmark	...	...	...	...	...	...	5	5
France	6	1	3	2	7	2	10	21
Germany	5	1	...	2	2	2	3	15
Great Britain	10	9	11	24	12	17	49	132*
Greece	...	...	...	...	...	1	...	1
Holland	...	...	...	...	...	1	1	2
Italy	...	...	1	...	...	1	10	12
Japan	3	2	...	...	...	2	2	9
Peru	...	...	...	1	...	...	1	2
Russia	1	1	...	...	...	1	2	5
Spain	...	1	...	...	...	...	2	3
Sweden	...	...	...	...	...	...	2	2
United States	6	7	...	11	2	11	18	55
	31	23	15	42	23	41	111	286

* P. & O., 28; British India, 14; White Star, 13; Union Castle, 13; Can. Pacific R., 11; Cunard, 9; Orient, 9; Union of N.Z., 6; Allan, 4; Atlantic Transport, 4; Anchor, 3; Huddart Parker, 3; Canadian Northern S.S. Co., Grand Trunk Pacific Coast S.S. Co., Howard Smith & Co., 2 each; Adelaide S.S. Co., Anglo-Algerian S.S. Co., Bermuda Atlantic S.S. Co., International Nav. Co., Ltd., Khedivial Mail S.S. Co., Quebec S.S. Co., Royal Mail, and Wilson Line, 1 each.

N.B.—There were on June 30, 1912, about 2,785 steamers in the world capable of a sea-speed of at least 12 knots per hour, of which about 1,573 were British. Of the total number about two-thirds are ocean-going steamers.

LARGEST STEAMERS FITTED FOR LIQUID FUEL.

Built in	Name.	Gross Tons.	Speed.	Owners.
1908	Tenyo Maru	13,454	20	Toyo Kisen Kabushiki Kaisha.
1908	Chiyo Maru	13,431	20	" " "
1910	*Kiyo Maru	9,287	14	" " "
1903	*Narragansett	9,196	†	Anglo-American Oil Co., Ltd.
1903	Arizonan	8,672	12	American-Hawaiian S.S. Co.
1901	Alaskan	8,672	12	" " "
1902	Texan	8,615	13	" " "
1907	Columbian	8,580	13	" " "
1907	Mexican	8,580	13	" " "
1903	Missourian	7,914	13	" " "
1903	Virginian	7,914	13	" " "
1903	*Goldmouth	7,446	†	Anglo-Saxon Petroleum Co., Ltd.
1912	Helouan	7,367	18	Lloyd Austriaco.
1911	Wien	7,367	18	" "
1902	*Pectan	7,291	†	Pectan S.S. Co., Ltd. (Thomas Woodsend).
1903	Spondilus	7,291	†	Anglo-Saxon Petroleum Co., Ltd.
1910	Honolulan	7,059	14	American-Hawaiian S.S. Co.
1903	*Ashtabula	7,025	†	Anglo-American Oil Co., Ltd.

* Fitted for the carriage of petroleum in bulk. † Under 12 knots.

LONGEST RIVERS OF THE WORLD.

River	Length
North America	
Mississippi-Missouri	4,194
Yukon	2,050
Colorado	2,000
South America	
Amazon	3,300
La Plata	2,950
Africa	
Nile	3,670
Kongo	2,800
Niger	2,600
Asia	
Obe	3,235
Yangtsekiang	3,000
Lena	2,860
Amur	2,700
Mekong	2,600
Yenisei	2,500
Hwangho	2,300
Indus	2,000
Europe	
Volga	2,325

MERCANTILE FLEETS—BRITISH AND FOREIGN.

Lines.	Head Office.	Total Tonnage.	Over 20 knots	Knots. 20	19	18	17	16	15	14	13	12	Under 12 knots.	Total.
Hamburg-American	Hamburg	943,000	...	1	...	1	3	5	6	5	15	48	108	193
Norddeutscher Lloyd	Bremen	775,000	4	1	...	3	...	5	12	9	9	36	50	129
P. & O. Steam N. Co.	London	543,000	2	1	1	16	2	6	3	22	7	1	5	66
British India Steam N. Co.	London	490,000	...	...	...	...	5	11	5	13	7	26	50	114
White Star	Liverpool	479,000	2	0	2	1	5	3	1	...	13	1	6	34
Pittsburgh S.S. Co.	Cleveland	464,000	...	...	...	...	...	...	...	...	...	...	...	107
"Blue Funnel" Line	Liverpool	451,000	...	...	...	...	...	...	...	25	22	12	9	68
Furness, Withy & Co., Ltd.	West Hartlepool	420,000	...	...	...	...	...	...	...	...	3	4	112	119
Ellerman Lines, Ltd.	Liverpool	406,000	...	...	...	...	...	...	2	6	8	33	46	95
Hansa	Bremen	362,000	...	...	...	...	...	...	...	...	...	...	...	71
Nippon Yusen Kaisha	Tokio	330,000	...	...	...	...	...	1	9	10	17	4	37	78
Compagnie Générale Trans.	Paris	321,000	4	1	1	3	6	5	6	6	1	9	35	77
Union-Castle Line	London	309,000	...	...	...	...	11	2	...	2	6	13	10	44
Leyland	Liverpool	301,000	...	...	...	...	...	...	...	6	8	17	18	49
Messageries Maritimes	Paris	300,000	...	...	...	...	...	...	14	1	20	22	8	65
Harrison	Liverpool	285,000	...	...	...	...	...	...	...	...	35	19	1	55
Cunard	Liverpool	259,000	3	...	...	2	...	4	1	1	3	...	9	23
Elder, Dempster & Co., Ltd.	Liverpool	258,000	...	...	...	...	1	...	1	4	13	13	58	89
Hamburg-South American	Hamburg	251,000	...	...	...	...	1	...	2	1	1	5	46	56
Clan	Glasgow	238,000	...	...	...	...	...	...	...	7	...	26	27	60
Royal Mail S.P. Co.	London	238,000	...	...	...	...	...	1	15	...	5	4	25	50
Nederland Line	Amsterdam	225,000	...	...	...	...	...	...	11	...	17	...	8	36
Austrian Lloyd	Trieste	221,000	...	...	...	2	2	3	3	8	21	13	13	65
Deutsche-Australische	Hamburg	220,000	...	...	...	...	...	...	...	...	...	...	46	46
Canadian Pacific Railway	Montreal	219,000	2	2	...	4	...	2	...	...	18	...	43	71
Allan	Glasgow	200,000	...	...	2	2	...	2	3	4	1	4	8	26
Wilson	Hull	199,000	...	...	...	...	...	1	...	3	4	5	60	83
Union S.S. Co. of N. Zealand	Dunedin	197,000	...	...	2	...	1	3	6	7	7	11	33	70
Kosmos	Hamburg	190,000	...	...	...	...	...	...	...	...	...	9	21	30
Pacific Steam N. Co.	Liverpool	183,000	...	...	...	...	...	...	1	4	7	5	24	41
Società Anonima Nazionale di Servizi Marittimi	Rome	181,000	...	...	...	...	...	...	5	2	20	19	29	75
Lamport & Holt	Liverpool	177,000	...	...	...	...	...	...	3	4	2	14	12	35
Maclay & McIntyre	Glasgow	177,000	...	...	...	...	...	...	...	...	...	...	53	53
Forenede Dampskibs Selskab	Copenhagen	172,000	...	...	...	...	...	5	3	2	6	5	109	130
R. Ropner & Co.	West Hartlepool	170,000	...	...	...	...	...	...	...	...	...	...	52	52
Osaka S. K., Ltd.	Osaka	163,000	...	...	...	...	...	...	...	...	2	7	100	112
Prince	Newcastle-on-Tyne	156,000	...	...	...	...	...	...	...	...	...	14	27	41
Bucknall S.S. Lines, Ltd.	London	152,000	...	...	...	...	...	...	...	...	3	9	20	32
Andrew Weir & Co.	Glasgow	146,000	...	...	...	...	...	...	...	1	2	5	33	41
John Henry Usmar	London	144,000	...	...	...	...	...	...	...	...	...	...	...	36
Gilchrist Transportation Co.	Cleveland, Ohio	144,000	...	...	...	...	...	...	...	...	...	...	...	33
Wm. Ruys & Sons	Rotterdam	144,000	...	...	...	...	...	...	...	8	4	6	16	34
New Zealand Shipping Co.	London	143,000	...	...	...	...	...	...	...	4	11	3	...	18
Unione Austriaca di Nav.	Trieste	142,000	...	...	...	...	1	2	2	2	5	5	15	31
Burrell & Son	Glasgow	140,000	...	...	...	...	...	...	...	...	...	...	...	32
Koninklijke Paketvaart M.	Amsterdam	139,000	...	...	...	...	...	...	1	2	...	25	57	85
Red Star Line	Antwerp	135,000	...	...	4	1	1	3	...	2	...	...	...	11
Chargeurs Réunis	Paris	132,000	...	...	...	...	...	...	...	4	...	2	...	25
Deutsche Levante Linie	Hamburg	130,000	...	...	...	...	...	...	...	...	...	...	...	50
Edward Hain & Son	St. Ives	129,000	...	...	...	...	...	...	...	...	...	...	...	36
Holland-American	Rotterdam	126,000	...	...	...	...	1	1	3	...	...	...	8	13
W. Wilhelmsen	Tonsburg	125,000	...	...	...	...	...	...	...	...	...	...	...	33
American-Hawaiian S.S. Co.	New York	124,000	...	...	...	...	...	...	...	1	10	7	...	18
Anchor	Glasgow	123,000	...	...	...	...	1	2	1	1	4	8	3	20
China Nav. Co., Ltd.	London	122,000	...	...	...	...	...	...	...	...	...	...	...	63
Moor Line	Newcastle-on-Tyne	122,000	...	...	...	...	...	...	...	...	...	...	...	34
Russian Steam Nav. Co.	Odessa	120,000	...	...	...	...	...	...	...	2	...	13	55	70
Booth	Liverpool	114,000	...	...	...	...	...	...	2	4	...	2	22	30
Anglo-Saxon Petroleum Co.	London	114,000	...	...	...	...	...	...	...	...	...	...	...	28
Hugh & W. Nelson, Ltd.	Liverpool	113,000	...	...	...	...	...	...	...	...	10	6	1	17
Woermann Linie	Hamburg	112,000	...	...	...	...	...	...	...	...	6	4	27	37
Deutsche Amerikanische Petroleum Co.	Hamburg	109,000	...	...	...	...	...	...	...	...	...	...	...	26
Deutsche Ost Afrika	Hamburg	109,000	...	...	...	...	...	...	2	4	2	9	9	26
S. A. Tomlinson	Duluth	106,000	...	...	...	...	...	...	...	...	...	...	...	19
Thomas (Evan) Radcliffe & Co.	Cardiff	105,000	...	...	...	...	...	...	...	...	...	...	...	27

Houlders Bros.; Great Lakes Steamship Co.; Russian Volunteer Fleet; Soc. Gén. de Transport Maritimes à Vapeurs, each 104,000 tons; Lloyd Brazileiro, 102,000 tons; C. T. Bowring & Co.; Nav. Gen. Italiana; and Pacific Mail S.S. Co., each 100,000 tons.

The World's Fastest Merchant Ships Now in Service.

(Vessels of 22 Knots and over)

	Built	Tons gross	Speed knots
British (24 Ships):			
Ben-My-Chree (turbine)	1908	2,651	25.34
Brighton (turbine)	1903	1,129	22
Campania	1893	12,950	22
Connaught	1897	2,641	23.55
Dieppe (turbine)	1905	1,216	22
Empress (turbine)	1907	1,695	22
Empress Queen (pad.)	1897	2,140	22
Invicta (turbine)	1905	1,680	22.9
Leinster	1897	2,641	23.5
Londonderry (turbine)	1904	1,950	22.3
Lusitania (turbine)	1907	31,550	25.88
Manxman (turbine)	1904	2,174	23.14
Mauretania (turbine)	1907	31,937	26.06
Olympic	1911	45,324	22.5
Onward (turbine)	1905	1,671	22.9
Riviera (turbine)	1911	1,750	23.07
St. Andrew (turbine)	1908	2,528	22.50
St. David (turbine)	1906	2,529	22.50
St. George (turbine)	1906	2,456	22.50
St. Patrick (turbine)	1906	2,531	22.50
The Queen (turbine)	1903	1,676	22.25
Victoria (turbine)	1907	1,689	22
Viking (turbine)	1905	1,951	23.53
Viper (turbine)	1906	1,713	22
Belgian (6 Ships):			
Jan Breydel (turbine)	1909	1,750	24
Leopold II. (pad.)	1892	1,367	22
Marie Henriette (pad.)	1893	1,451	22
Pieter de Coninck (turb.)	1910	1,750	24
Princesse Clementine (pad.)	1896	1,474	22
Princesse Elisabeth (turbine)	1905	1,747	24
Dutch (3 Ships):			
Mecklenburg	1909	2,885	22.50
Oranje Nassau	1909	2,885	22.50
Prinses Juliana	1909	2,885	22.50
French (3 Ships):			
France	1910	27,000	24
La Provence	1906	13,753	22
Newhaven (turbine)	1911	—	23
German (5 Ships):			
Deutschland	1900	16,502	23
Kaiser Wilhelm II	1902	19,361	23.25
Kaiser Wilhelm der Grosse	1897	14,349	22.50
Kronprinzessin Cecilie	1907	19,503	23.50
Kronprinz Wilhelm	1901	14,908	23

Courtesy of "Shipping World Year Book."

A Humiliating News Item.

NO U. S. FLAG ON THE THAMES.

NOT A VESSEL FLYING IT ENTERED THE PORT OF LONDON LAST YEAR.

By Marconi Transatlantic Wireless Telegraph to The New York Times.

LONDON, May 8.—The Pall Mall Gazette publishes as a startling fact a report by the Medical Officer for the Port of London that no vessel flying the Stars and Stripes arrived in the Thames in the whole of last year.

Time and Watch on Board Ship.

Watch. For purposes of discipline, and to divide the work fairly, the crew is mustered in two divisions—the Starboard (right side, looking forward) and the Port (left). The day commences at noon, and is thus divided:—

Afternoon *Watch*	....	noon to 4 p. m.
First Dog "	....	4 p.m. to 6 p.m.
Second Dog "	....	6 p.m. to 8 p.m.
First "	....	8 p.m. to midnight.
Middle "	....	12 p.m. to 4 a.m.
Morning "	....	4 a.m. to 8 a.m.
Forenoon "	....	8 a.m. to noon.

This makes seven Watches, which enables the crew to keep them alternatively, as the *Watch* which is on duty in the forenoon one day has the afternoon next day, and the men who have only four hours' rest one night have eight hours the next. This is the reason for having *Dog Watches*, which are made by dividing the hours between 4 p.m. and 8 p.m. into two *Watches*.

Time.—Time is kept by means of "Bells," although there is but one bell on the ship, and to strike the clapper properly against the bell requires some skill.

First, two strokes of the clapper at the interval of a second, then an interval of two seconds; then two more strokes with a second's interval apart, then a rest of two seconds, thus:—

Bell, one second; B., two secs.; B. s.; B. ss.; B. s.; B. ss.; B.

1. Bell is struck at 12.30, and again at 4.30 6.30, 8.30 p.m.; 12.30, 4.30, and 8.30 a.m.

2 Bells at 1 (struck with an interval of a second between each—B. s. B.), the same again at 5, 7, and 9 p.m.; 1, 5, and 9 a.m.

3 Bells at 1.30 (B. s, B. ss, B.) 5.30, 7.30, and 9.30 p.m.; 1.30, 5.30, and 9.30 a.m.

4 Bells at 2 (B. s, B. ss, B. s, B.) 6 and 10 p.m.; 2, 6, and 10 a.m.

5 Bells at 2.30 (B. s, B. ss, B. s, B. ss, B.) and 10.30 p.m.; 2.30, 6.30, and 10.30 a.m.

6 Bells at 3 (B. s, B. ss, B. s, B. ss, B. s, B.) and 11 p.m.; 3, 7, and 11 a.m.

7 Bells at 3.30 (B. s, B. ss, B. s, B. ss, B. s, B. ss, B) and 11.30 p.m.; 3.30, 7.30, and 11.30 a.m.

8 Bells (B. s, B. ss, B. s, B. ss, B. s, B. ss, B, s. B.) every 4 hours, at noon, at 4 p.m. 8 p.m., midnight, 4 a.m., and 8 a.m.

Depth of the Sea.

	Yards depth. Average.	Max.
Atlantic	4,026	10,120
Pacific	4,252	10,695
Indian	3,658	7,565
Arctic	1,690	4,400
Antarctic	3,000	3,950
Mediterranean	1,476	4,090
Irish	240	710
English Channel	110	300
German	96	..
Levant	72	..
Adriatic	45	..
Baltic	43	..

The Southern Ocean below Cape Horn reaches a depth of 5,500 yards, and off Cape of Good Hope, 5,700 yards. The average depth of the Bay of Biscay is 1,200 yards.

FIRST STEAMBOATS, PIONEER SAILINGS AND EARLIEST LINES.

1707. Denis Papin experimented on River Fulda with paddle-wheel steamboat.

1736. Jonathan Hulls patented designs similar to modern paddle boat.

1769. James Watt invented a double-acting side-lever engine.

1783. Marquess of Jouffrey made experiments in France.

1785. James Ramsey, in America, propelled a boat with steam through a stern-pipe.

1785. Robert Fitch, in America, propelled a boat with canoe-paddles fixed to a moving beam.

1787. Robert Miller, of Edinburgh, tried primitive manual machinery.

1788. Miller, with Symington, produced a double-hull stern-wheel steamboat.

1802. *Charlotte Dundas*, the first practical steam tugboat, designed by Symington.

1804. *Phœnix*, screw-boat designed by Stephens in New York; first steamer to make a sea voyage.

1807. *Clermont*, first passenger steamer continuously employed; built by Fulton in U.S.A.

1812. *Comet*, first passenger steamer continuously employed in Europe; built by Miller in Scotland.

1818. *Rob Roy*, first sea-trading steamer in the world; built at Glasgow.

1819. *Savannah*, first auxiliary steamer, paddle wheels, to cross the Atlantic; built in New York.

1821. *Aaron Manby*, first steamer (English canal boat) built of iron.

1823. City of Dublin Steam Packet Co. was established.

1824. General Steam Navigation Co. was established at London.

1824. George Thompson & Co. (Aberdeen Line) were established.

1825. *Enterprise* made the first steam passage to India.

1825. *William Fawcett*, pioneer steamer of the P. & O. S. N. Co.

1830. T. & J. Harrison (Harrison Line) were established at Liverpool.

1832. *Elburkah*, iron steamer, took a private exploring party up the Niger.

1834. Lloyd's Register for British and Foreign Shipping established.

1836. F. Green & Co. established at London.

1836. Austrian Lloyd Steam Navigation Co. established at Trieste.

1837. *Francis B. Ogden*, first successful screw tugboat; fitted with Ericsson's propeller.

1838. *Archimedes*, made the Dover-Calais passage under two hours, fitted with Smith's propeller.

1838. *R. F. Stockton*, built for a tugboat, fitted with Ericsson's propeller, sailed to America; first iron vessel to cross the Atlantic; first screw steamer used in America.

1839. *Thames*, pioneer steamer of the Royal Mail Steam Packet Co.

1839. George Smith & Sons (City Line) were established at Glasgow.

1840. *Britannia*, pioneer steamer of the Cunard Line.

1840. *Chile*, pioneer steamer of the Pacific Steam Navigation Co.

1845. *Great Britain*, first iron screw steamer, precursor of modern Atlantic steamer.

1845. Thos. Wilson, Sons & Co., Ltd. (Wilson Line) established at Hull.

1847. Pacific Mail Steamship Co. established in America.

1849. Houlder Brothers & Co. established at London.

1850. Bullard, King & Co. (Natal Line) established at London.

1850. Messageries Maritimes de France established.

1850. Inman (now American) Line, established at Liverpool.

1851. *Tiber*, first steamer of the Bibby Line, established 1821 at Liverpool.

1852. *Forerunner*, pioneer steamer of the African Steamship Co.

1853. Union Steamship Co. was established (now Union-Castle Line).

1853. *Borussia*, first steamer of the Hamburg-American Packet Co., established 1847.

1854. *Canadian*, first steamer of the Allan Line, established 1820.

1854. Donaldson Bros. established at Glasgow.

1855. British India Steam Navigation Co. was established.

1856. *Tempest*, first steamer Anchor Line.

1857. *Waldensian*, first steamer of J. T. Rennie, Son & Co. (Aberdeen Line).

1858. *Bremen*, first Atlantic steamer of the Norddeutscher Lloyd, established 1856.

1858. *Great Eastern* launched into the Thames, Jan. 31; commenced, May 1, 1854.

1858. British and African Steam Navigation Co., Ltd., established at Liverpool.

1861. E. Ropner & Co. established at West Hartlepool.

1862. Shaw, Savill & Co. established at London.

1862. Compagnie Générale Transatlantique established at Havre.

1866. Det Forenede Dampskibs Selskab (United Steamship Co.) was established at Copenhagen.

1866. Booth Line established at Liverpool.

1866. *Agamemnon*, first steamer of Alfred Holt (now the Blue Funnel Line).

1870. Nederland Line established at Amsterdam.

1870. Dominion Line established at Liverpool.

1870. Leyland Line formed at Liverpool.

1871. Hamburg-South American Steamship Co. established at Hamburg.

1872. Glen Line established at London.

1872. Red Star Line established at Antwerp.

1872. Chargeurs Réunis established at Paris.

1872. Holland-Amerika Line established at Rotterdam.

1873. New Zealand Shipping Co. was formed at Christchurch, New Zealand.

1873. Kosmos Co. established at Hamburg.

1877. Orient Line established at London.

1878. Clan Line established at Glasgow.

1878. Hain Steam Ship Co., Ltd., established.

1881. Cia. Trasatlantica formed at Barcelona.

1881. Moor Line began at Newcastle-on-Tyne.

1881. Prince Line began at Newcastle-on-Tyne.

1883. Houston Line was formed at Liverpool.

1883. Rotterdam Lloyd formed at Amsterdam.

1885. Federal Steam N. Co., Ltd., established at London.

1885. Nippon Yusen Kaisha established at Japan.

1886. Atlantic Transport Co., Ltd., formed in London.

1888. Anglo-American Oil Co., Ltd. formed in London.

1888. German Australian S.S. Co. established.

LOWEST OCEAN RATES.

To and from New York, English and Continental Ports.
(Subject to change without notice.)

Lines.	1st Class to or from Europe.	2d Class to or from England.	2d Class to or from Continent.
American Line			
SSs. New York, St. Paul, St. Louis and Philadelphia	$95.00	$52.50	$60.00
PHILADELPHIA-LIVERPOOL STEAMERS			
SSs. Haverford and Merion	50.00	....	....
SSs. Dominion	47.50	....	....
Atlantic Transport Line			
SSs. Minneapolis, Minnetonka, Minnehaha, Minnewaska	85.00	....	....
Anchor Line			
SSs. Columbia, Caledonia and Cameronia	75.00	50.00	....
SS. California	70.00	50.00	....
MEDITERRANEAN SERVICE			
SSs. Italia, Perugia and Calabria	....	....	60.00
Austro-Americana			
Kaiser Franz-Joseph I.	80.00	....	65.00
SS. Martha Washington	75.00		65.00
SSs. Laura, Alice, Argentina and Oceania	70.00	....	50.00
Cunard Line		....	
SSs. Lusitania and Mauretania	127.50	65.00	70.00
SS. Campania	105.00	55.00	60.00
SSs. Carmania and Caronia	100.00	57 50	62.50
BOSTON-LIVERPOOL SERVICE			
SSs. Franconia, Laconia	92.50	52.50	57.50
Ivernia and Saxonia	85.00	50.00	55.00
MEDITERRANEAN SERVICE			
SSs. Franconia and Laconia	100.00	....	65.00
SSs. Caronia and Carmania	105.00	....	65.00
SSs. Ivernia and Saxonia	85.00	....	65.00
SS. Carpathia	82.50	....	65.00
SS. Pannonia	75.00	....	55.00
French Line			
SS. France	122.50	....	70.00
SS. La Provence	110.00	....	65.00
SSs. La Savoie and La Lorraine	100.00	....	62.50
SSs. La Touraine and Espagne	90.00	....	60.00
SS. Rochambeau	....	....	57.50
SSs. Chicago and Niagara	....	....	55.00
SSs. Floride and Caroline	....	....	47.50
Fabre Line			
SS. Patria	75.00	....	55.00
SS. Sant' Anna and Canada	75.00	....	55.00
SSs. Madonna and Venezia	80.00	....	....
SSs. Roma and Germania	80.00	....	55.00
Hamburg-American Line			
SS. Imperator	127.50	67.50	72.50
SSs. Amerika and Kaiserin Aug. Victoria	115.00	60.00	65.00
SSs. Cleveland, Cincinnati and Victoria Luise	97.50	57.50	60.00
SSs. Moltke and Bluecher	95.00	55.00	60.00
SSs. President Lincoln, President Grant and Hamburg	90.00	55.00	60.00
SSs. Graf Waldersee and Pennsylvania	....	....	57.50
MEDITERRANEAN SERVICE			
SS. Moltke	95.00	....	65.00
SS. Hamburg	90.00	....	65.00
SS. Batavia	....	....	65.00
Holland-America Line			
SS. Rotterdam	107.50	57.50*	62.50
SS. New Amsterdam	95.00	55.00*	57.50
SS. Noordam and other ships	85.00	....	55.00
Italian Royal Mail Lines			
SSs. Verona and Ancoma	80.00	....	65.00
SSs. America, Europa and Stampolia	80.00	....	65.00
PHILADELPHIA-MEDITERRANEAN SERVICE			
All steamers	80.00	....	....
BOSTON-MEDITERRANEAN SERVICE			
SSs. Palermo and Napoli	....	....	65.00
Lloyd Italiano			
SS. Taornima	80.00	....	65.00
SS. Mendoza	65.00	....	....

*New York to Plymouth only.

LOWEST OCEAN RATES—Continued.

Lines.	1st Class to or from Europe.	2d Class to or from England.	2d Class to or from Continent.
Lloyd Sabaudo			
SSs. Tomaso di Savoia and Principe di Udine	75.00	....	65.00
All other steamers	70.00	....	65.00
North German Lloyd			
SSs. Kronprinzessin Cecilie and Kaiser Wilhelm II.	125.00	65.00	70.00
SSs. Kronprinz Wilhelm, Kaiser Wilhelm der Grosse	122.50	65.00	70.00
SS. George Washington	115.00	60.00	65.00
SS. Prinz Friedrich Wilhelm	100.00	57.50	62.50
SS. Grosser Kurfuerst	95.00	55.00	60.00
SS. Barbarossa and other ships	90.00	55.00	60.00
Mediterranean Service			
SS. Berlin	100.00	....	65.00
All other steamers	90.00	....	65.00
Red Star Line			
SS. Lapland	97.50	57.50	60.00
SSs. Finland, Kroonland and Vaderland	85.00	55.00	55.00
Philadelphia-Antwerp Service			
All steamers	....	....	55.00
Russian-American Line.			
SSs. Russia, Kursk and Czar *	....	....	....
Scandinavian-American Line			
All steamers	77.50	....	....
White Star Line			
SS. Olympic	130.00	65.00	70.00
SS. Adriatic	110.00	57.50	....
SS. Oceanic	110.00	57.50	62.50
SSs. Majestic	95.00	52.50	60.00
SSs. Baltic, Cedric and Celtic	100.00	55.00	....
Boston-Liverpool Service			
SS. Arabic	....	53.75	....
SS. Cymric	....	52.50	....
Mediterranean Service			
SS. Canopic	85.00	....	65.00
SS. Cretic	82.50	....	65.00

* The minimum first class fare from New York to Rotterdam is $65.00 and to Libau $75.00. Second class fare from New York to Rotterdam is $45.00 and to Libau $50.00. The minimum first class fare from Libau to New York is $75.00 and second class fare $62.50.

The above are the lowest or minimum rates from port to port. Through rates to London or Paris should be made by adding to the above rates the following railroad rates of class and from desired port:

From Liverpool to London: 1st Class, $7.00. In connection with 2d Class ocean tickets a 3d Class railroad ticket is furnished for $2.50. Fishguard to London, 1st Class, $8.25, and 3d Class, $2.50, in connection with 2d Class ocean tickets.

From Liverpool to Paris: 1st class $21.00; Fishguard to Paris $22.25. In connection with 2d Class ocean tickets, transportation is provided from Liverpool and Fishguard on payment of $7.50.

From Plymouth to London: 1st Class, $7.50; 2d Class, $4.75; 3d Class, $3.75.
From Dover to London: 1st Class, $4.75; 2d Class, $3.15.
From Southampton to London: 1st Class, $2.75; 2d Class, $1.75; 3d Class, $1.40.
From Cherbourg to Paris: 1st Class, $8.75; 2d Class, $6.25; 3d Class, $3.60.
From Havre to Paris· 1st Class, $5.60; 2d Class, $4.00; 3d Class, $2.50.
From Boulogne-sur-Mer to Paris: 1st Class, $5.50; 2d Class, $3.70.
From Marseilles to Paris, 1st Class, $18.85; 2d Class $12.80.

PACIFIC MAIL STEAMSHIP COMPANY.—PANAMA LINE.

Between San Francisco and Mazatlan, San Blas, Manzanillo, Acapulco, Salina Cruz, Ocos, Champerico, San Jose de Guatemala, Acajutla, La Libertad, La Union, Amapala, Corinto, San Jose del Sue, Punta Arenas, Balboa (Panama).

San Francisco and Panama, $120. Round Trip, $216. Steerage, $60. San Francisco and New York, $120. Steerage, $65. San Francisco and New Orleans, $120. First class only.

New express, passenger and freight service direct for Panama and New York, calling only at San Pedro (Los Angeles) en route. San Francisco to Panama, $85. Round Trip, $150. To New York, $120. To New Orleans, $120.

TRANSATLANTIC PASSENGER STEAMERS FROM NEW YORK.*

AMERICAN LINE.

Steamships.	Year	Gross Tonnage	Indic. H.-P.	Length
New York (Rebuilt 1903)	1888	10,798	16,000	576
St. Louis	1895	11,629	17,500	554
St. Paul	1895	11,629	17,000	554
Philadelphia	1899	10,786	16,800	576

ANCHOR LINE.

Columbia	1901	8,400	8,400	503
Caledonia	1904	9,400	10,200	515
California	1907	9,000	7,000	485
Cameronia	1910	10,500	12,000	532

ATLANTIC TRANSPORT LINE.

Minneapolis	1900	13,448	9,500	616
Minnehaha	1900	13,443	9,500	616
Minnetonka	1902	13,440	9,500	616
Minnewaska	1909	14,317	9,500	616

AUSTRO-AMERICAN LINE.

Laura	1907	6,122	4,500	415
Alice	1907	6,122	4,500	415
Argentina	1907	5,526	3,600	416
Oceania	1907	5,497	3,600	390
Martha Washington	1909	8,312	7,500	460
Kaiser Franz-Joseph I	1912	12,567	13,000	500
Belvedere	1913	11,000	......	418

COMPAÑIA TRANSATLANTICA.

Cadiz and Barcelona Service.)

Antonio Lopez	1891	6,300	5,000	430
Manuel Calvo	1892	6,000	6,000	419.8
Buenos Ayres	1887	5,500	4,800	410.6
Monte-Video	1889	5,500	5,000	410
Montserrat	1889	4,500	4,500	371

CUNARD LINE.

(Queenstown and Liverpool Service.)

Campania	1893	13,000	30,000	620
Mauretania	1907	32,000	70,000	790
Lusitania	1907	32,500	70,000	785
Caronia	1905	20,000	21,000	675
Carmania	1905	20,000	21,000	675
Franconia	1911	18,150	14,000	600
Laconia	1912	18,098	14,000	600
Aquitania (Building)	....	47,000	......	901

CUNARD LINE.

(Mediterranean and Adriatic Service.)

Ultonia	1898	10,200	......	500
Carpathia	1903	13,600	......	540
Pannonia	1904	10,000	......	501
Saxonia	1900	14,270	10,400	580
Ivernia	1900	14,210	10,400	580

TRANSATLANTIC PASSENGER STEAMERS FROM NEW YORK.—*Continued.*

FABRE LINE.

(Various points, including Naples, depending on season of year.)

Steamships.	Year.	Gross Tonnage	Indic. H.-P.	Length.
Roma	1902	5,291	6,000	426
Germania	1903	5,103	6,000	426
Madonna	1905	5,633	6,200	450
Venezia	1907	6,827	7,200	460
Sant' Anna	1910	9,350	10,000	500
Canada	1912	9,350	10,000	500
Patria	1914	.....	12,000	525

FRENCH LINE.

La Touraine	1890	9,161	12,000	536
La Lorraine	1899	11,874	22,000	580
La Savoie	1900	11,889	22,000	580
La Provence	1906	14,744	30,000	624
Chicago	1906	11,112	9,200	520
Niagara	1908	9,614	8,250	504
Rochambeau	1911	12,678	13,000	543
France	1912	23,666	40,000	720

HAMBURG-AMERICAN LINE.

Pennsylvania	1896	13,333	5,500	557.6
Patricia	1897	13,273	6,000	560
Pretoria	1898	13,234	5,400	560
Bulgaria*	1898	11,077	4,000	501.6
Graf Waldersee	1899	13,193	5,500	560
Batavia*	1899	11,464	4,000	501
Victoria Luise	1900	16,502	14,000	686.6
Hamburg*	1900	10,532	9,000	498
Bluecher	1901	12,334	9,500	525.6
Moltke*	1902	12,335	9,500	525
Amerika	1905	22,225	15,500	690
Kaiserin Auguste Victoria	1906	24,581	17,500	700
President Lincoln	1907	18,100	7,500	615
President Grant	1907	18,100	7,500	615
Cleveland	1908	18,000	9,300	600
Cincinnati	1908	18,000	9,300	600
Imperator	1913	50,000	62,000	919
Vaderland (Building)	1914	......	......	...

* Mediterranean Service.

HOLLAND-AMERICA LINE.

(Netherlands-American Steam Navigation Co.)

Potsdam	1900	12,600	7,500	560
Ryndam	1901	12,546	7,590	560
Noordam	1902	12,540	7,500	560
New Amsterdam	1906	17,250	10,000	615
Rotterdam	1908	24,170	14,000	668
Statendam (Building)	....	35,000	21,000	740

ITALIA LINE

(Società di Navigazione a Vapore. Naples, Genoa, New York Service.)

Napoli	1899	9,203	7,000	470
Ancona	1908	10,000	7,600	520

LA VELOCE LINE.

(Navigazione Italiana a Vapore).

Stampolia	1908/9	12,000	9,000	525
Europa	1906	8,000	9,000	425

NAVIGAZIONE GENERALE ITALIANA LINE.

(Florio Rubattino).

America	1909	12,000	9,000	525
Verona	1908	10,000	7,600	520
Palermo	1899	9,203	7,000	470

TRANSATLANTIC PASSENGER STEAMERS FROM NEW YORK—*Continued.*

LLOYD ITALIANO.

Steamships.	Year.	Gross Tonnage	Indic. H.-P.	Length.
Florida	1905	5,018	444	381.4
Luuisiana	1906	4,983	444	393.7
Indiana	1905	4,996	444	393.7
Virginia	1906	5,181	477	381.4
Mendoza	1905	6,847	6,000	420
Taornima	1908	10,000	7,600	520

NORTH GERMAN LLOYD.
(Bremen Service.)

Friedrich der Grosse	1896	10,568	7,200	546
Bremen	1896	11,570	8,000	569
Kaiser Wilhelm der Grosse	1897	14,349	28,000	649
Rhein	1899	10,058	5,500	520
Grosser Kurfürst	1900	13,245	9,700	582
Main	1900	10,067	5,500	520
Kronprinz Wilhelm	1901	14,908	35,000	663
Kaiser Wilhelm II	1903	19,500	43,000	707
Prinzess Alice	1904	10,911	9,000	524
Kronpr'n Cecilie	1907	20,000	45,000	707
Prinz Fr. Wilhelm	1908	17,500	14,000	613
George Washington	1909	25,570	20,000	723
Columbus	1914	40,000	25,000	800

NORTH GERMAN LLOYD.
(Mediterranean Service.)

Koenigin Luise	1896	10,711	7,000	544
Barbarossa	1896	10,915	7,000	546
Koenig Albert	1899	10,643	9,000	525
Prinzess Irene	1900	10,881	9,000	525
Berlin	1908	19,200	16,500	613

RED STAR LINE.

Vaderland	1900	11,960	10,000	580
Zeeland	1901	11,905	9,800	580
Finland	1902	12,188	9,300	577
Kroonland	1902	12,185	9,400	577
Lapland	1909	18,694	14,500	620
(Building)	1915	......	......	670

RUSSIAN-AMERICAN LINE.

Russia	1909	16,000	10,000	475
Kursk	1911	14,000	10,000	450
Czar	1912	13,500	10,000	425

SCANDINAVIAN-AMERICAN LINE.

C. F. Tietgen	1897	8,500	5,500	485
Oscar II	1901	10,000	8,000	515
Hellig Olav	1902	10,000	8,000	515
United States	1903	10,000	8,000	515
Frederik VIII. (Building)	1913	12,000	10,000	541.5

WHITE STAR LINE.

Majestic	1890	10,147	16,000	582
Oceanic	1899	17,274	28,000	705
Canopic	1900	12,097	8,730	594
Celtic	1901	20,904	14,000	697
Cedric	1902	21,035	14,000	697
Baltic	1904	23,876	15,000	726
Adriatic	1907	24,541	17,000	726
Laurentic	1909	14,892	14,000	565
Megantic	1909	14,878	11,000	565
Olympic	1911	46,359	46,000	882.6

TRANSATLANTIC PASSENGER STEAMERS FROM PORTS OTHER THAN NEW YORK.

CUNARD LINE.

(Boston-Liverpool Service.)

Steamships.	Year	Gross Tonnage.	Indic. H.-P.	Length.
Franconia	1911	18,150	14,000	600
Laconia	1912	18,098	14,000	600

ALLAN LINE.

Parisian	1881	5,395	774	440
Numidian	1891	4,836	582	400
Mongolian	1891	4,838	582	400
Carthaginian	1884	4,444	475	386
Siberian	1884	3,846	463	372
Hungarian	1902	4,508	446	388
Hibernian	1902	4,505	446	385
Ontarian	1900	4,309	359	385
Orcadian	1893	3,546	328	361

LEYLAND LINE.

Devonian	1900	10,435	4,702	571
Winifredian	1899	10,422	4,505	571
Canadian	1900	9,309	4,120	549
Bohemian	1900	8,555	4,019	529

WHITE STAR LINE.

Cymric	1898	13,096	7,700	599
Cretic	1902	13,518	7,300	601
Arabic	1903	15,801	9,200	615.6

WHITE STAR LINE.

(Australian Service.)

Gothic	1893	7,758	4,460	504
Belgic	1903	9,767	4,000	505
Ceramic	1913	18,000	.....	...

NORTH GERMAN LLOYD S. S. CO.

(Bremen-Boston-New Orleans Service.)

Breslau	1901	7,524	3,400	428
Cassel	1901	7,553	3,400	428
Chemnitz	1901	3,200	7,542	430
Frankfurt	1899	3,200	7,431	431
Koeln	1901	8,850	3,400	445
Hannover	1901	8,850	3,400	445
Brandenburg	1901	8,850	3,400	445

ALLAN LINE.

(Montreal Services.)

Victorian	1904	10,629	....	520
Virginian	1905	10,754	....	520
Tunisian	1900	10,576	849	500
Corsican	1907	11,419	917	500
Hesperian	1908	10,920	803	485
Grampian	1907	10,947	825	485
Ionian	1901	8,268	604	470
Pretorian	1901	6,508	800	436
Corinthian	1899	6,229	447	430
Sicilian	1899	6,229	447	430
Sardinian	1875	4,349	316	400
Pomeranian	1882	4,207	550	381
Alsatian (Building)	1913	17,000	18,000	560
Albynian (Building)	1913	17,000	18,000	560

TRANSATLANTIC PASSENGER STEAMERS FROM PORTS OTHER THAN NEW YORK—*Continued.*

CANADIAN PACIFIC RAILWAY CO.

Steamships.	Year.	Gross Tonnage.	Indic. H.-P.	Length.
Empress of Britain	1906	14,500	3,168	548.8
Empress of Ireland	1906	14,500	3,168	548.9

Royal Mail Steamers "Empress of Britain" and "Empress of Ireland" leave Quebec in Summer and St. John in Winter. Other vessels of the line carry second only, second and steerage only, and steerage only. Their names are therefore omitted here.

WHITE STAR-DOMINION.

Laurentic	1909	14,892	......	484
Megantic	1909	15,000	......	550
Canada	1896	9,413	6,641	514
Dominion	1894	7,036	3,514	456
Teutonic	1889	9,984	16,000	582

DONALDSON LINE.
(Montreal to Glasgow.)

Athenia	1904	8,668	5,600	478
Cassandra	1906	8,135	5,555	455
Saturnia	Building	......	......	....

MONTREAL SERVICES—THOMSON LINE.
(Mediterranean Service.)

Tortona	1909	7,907	5,400	450.6

PHILADELPHIA STEAMSHIP SERVICES—AMERICAN LINE.

Haverford	1901	11,635	4,157	547
Merion	1902	11,621	3,953	547

RED STAR LINE.

Marquette	1898	7,058	3,700	502
Menominee	1897	6,918	3,700	490
Manitou	1898	6,848	3,700	490

CUNARD LINE.
(Montreal—London.)

Ascania	1911	9,111	....	482
Ansonia	1909	7,907	....	465
Andania	1913	13,404	....	540
Alannia	1913	13,300	....	540

FRENCH LINE.
(Quebec—Havre Service.)

Niagara	1908	9,614	8,250	504
Floride	1908	7,029	3,400	437
Caroline	1908	7,220	4,200	437

(New Orleans—Havre Service.)

Louisiane	1908	5,399	3,000	403
Californie	1905	5,455	3,000	417
Virginie	1907	5,579	2,300	409
Mexico	1907	5,276	3,000	409

These tables include the principal lines engaged in European trade. There are other lines, however, carrying passengers, but which are omitted on account of infrequent or irregular services, or failure to respond to copies of proof sheets sent out for correction. The Editor takes no responsibility for the list as printed, though more than ordinary care has been used in its compilation and correction. It should also be borne in mind that "Lowest Ocean Rates" means only the lowest fares at any season of the year. During the rush or "high" season these fares usually apply only to a very few inside rooms, and plans should not be based on this schedule without consulting the steamship company or a reputable tourist agency to find if any minimum accommodations are available. In the fall and winter seasons superior rooms can usually be obtained at minimum rates without difficulty. If you live out of town do not wait until reaching New York, Boston or Philadelphia before attempting to secure passage. If you are going in July engage your passage in January if possible. There will be little difficulty in canceling accommodations if plans have to be changed, provided ample notice is given to enable steamship company to resell.

RATES TO EUROPEAN PORTS FROM CANADA.*

Allan Line.

MONTREAL AND QUEBEC TO LIVERPOOL.

First class passage from St. John or Halifax, $72.50 and up; Montreal or Quebec and Liverpool, $80.00 and up. Second class, $50.00 and up.

MONTREAL TO GLASGOW.

First class, $70.00 and up; second class, $50.00 and up. One class cabin, $47.50 and up.

Canadian Pacific Railway Co.

MONTREAL AND QUEBEC TO LIVERPOOL.

First class, $92.50 from Quebec; $85.00 from St. John, and upwards; second class, $53.75 and up. One class cabin (second class) $50.00 and up.

Cunard Line.

MONTREAL TO LONDON AND SOUTHAMPTON TO MONTREAL.

Cabin (called second), $46.25 and up.

Donaldson Line.

MONTREAL TO GLASGOW.

Cabin (called second), $47.50 and up. British third class, East, $31.25; prepaid West, $31.25.

White Star—Dominion Line.

MONTREAL AND QUEBEC TO LIVERPOOL.

First class, summer season, $92.50 and up; winter season, $85.00 and up; second class, $53.75 and up. One class cabin, $47.50 and up.

RATES TO WEST INDIAN, SOUTH AMERICAN PORTS, ETC.†

The Booth Steamship Co., Ltd.

NEW YORK AND PARA, MANAOS, VIA BARBADOS.

	Saloon Single	Saloon Return	Third Class
Barbados	$55	$110	$27.50
Para	90	160	48.00
Manaos	110	195	53.00
Iquitos, Peru	140	245	75.00

Canadian South African Line.

MONTREAL OR ST. JOHN, N. B., TO CAPE TOWN, PORT ELIZABETH, EAST LONDON, DURBAN, AND DELAGOA BAY.

First class—Cape Town, $110. Durban, $135.

Compañia Transatlantica.

NEW YORK, HAVANA, VERA CRUZ AND PUERTO MEXICO

	To Havana	To Vera Cruz	To Puerto Mexico
First class	$37	$60	$60
Second class	26	40	40

Round trip 10 per cent. discount.

Hamburg-American Line—Atlas Service.

NEW YORK TO COLON, COLUMBIA, COSTA RICA AND WEST INDIAN PORTS.

	1st Class One way	1st Class Round trip	2d Class One way	2d Class Round trip
Kingston Oct. 1 to May 31 or Santiago	$45 00	$85 50	$30 00	$57 00
Colon	75 00	142 50	45 00	85 50
Puerto Colombia	80 00	152 00	45 00	85 50
Cartagena	80 00	152 00	45 00	85 50
Santa Marta	80 00	152 00	45 00	85 50
Port-Limon	80 00	152 00	45 00	85 50
Port au Prince	60 00	100 00	35 00	60 00
Jeremie	60 00	100 00	35 00	60 00

CLYDE LINE

NEW YORK FOR CHARLESTON, S. C., AND JACKSONVILLE, FLA.

	Fares from New York to Charleston	Fares from New York to Jacksonville
First Cabin	$20 00	$24 90
Round Trip	32 00	43 30
Intermediate	15 00	19 00
Round Trip	24 00	34 80
Steerage	10 00	12 50

Insular Line, Inc.

NEW YORK AND PORTO RICO.

Rates of Passage. First class—To or from New York and Porto Rico, $25 and $30.

Lamport & Holt Line.

Direct service from New York to Brazil and Argentine. Steamers call at Bahia, Rio de Janeiro and Santos. Through tickets issued to Paranagua, Rio Grande do Sul, Montevideo, Buenos Ayres. All vessels call at Barbados and Trinidad northbound.

	Minimum 1st Class	Intermediate "V" Steamers	Intermediate S.S. Vestris and Van-dyck	3d Class
Bahia	$150	$75	$85	$45
Rio de Janeiro	150	75	85	45
Santos	160	80	90	50
Paranagua	165	—	—	62
Rio Grande do Sul	180	—	—	65
Porto Alegre	185	—	—	67
Montevideo	190	90	100	60
Buenos Ayres	190	90	100	60
Rosario	196	96	106	60

Children under 12 years of age, half fare; under two years, free. Servants in saloon, two-thirds fare.

* † All rates are subject to change without notice, and any tourist agent will give accurate figures as to cost. On Sept. 1, 1913, the rates quoted as printed were believed to be correct.

RATES TO WEST INDIAN AND SOUTH AMERICAN PORTS—Continued.

MUNSON STEAMSHIP LINE.

NEW YORK AND CUBA.

First Cabin.	One way.	Round trip.
New York to Nipe	$35.00	......
New York and Nuevitas	35.00	$66.50
New York and Puerto Padre.	50.00	......
New York and Gibara	50.00	95.50
New York and Banes	50.00	......
INTERMEDIATE.		
New York to Nipe	$25.00	......
New York to Nuevitas	25.00	$47.50
New York to Puerto Padre	35.00	......
New York to Gibara	35.00	......

NEW YORK & CUBA MAIL S.S. CO.

(WARD LINE.)

NEW YORK-HAVANA-MEXICO SERVICE.

To	1st Class.
Havana	$40.00 and up
Progreso	60.00
Mexico City	72.20
Vera Cruz	65.50
Puerto Mexico	75.00

Children under 3 years, not exceeding one to a family free; each additional child half fare. Children 8 to 12, accompanied by an adult, half fare.

NASSAU.

To	1st Class	2d Class
Nassau	$40.00	$15.00

NEW YORK & PORTO RICO S.S. CO.

NEW YORK AND SAN JUAN, PONCE AND MAYAGUEZ, PORTO RICO.

First class $45 and up. Excursion $81 and up. Second class $25 and up.

PANAMA RAILROAD STEAMSHIP LINE.

COLON—CANAL ZONE—PANAMA, SAN FRANCISCO, MEXICO, CENTRAL AND SOUTH AMERICA.

New York to Canal Zone (Colon)	$75.00
New York to Canal Zone, Round Trip	100.00
New York to San Francisco	120.00

PENINSULAR AND OCCIDENTAL S.S. COMPANY.

KEY WEST, CUBA AND THE WEST INDIES, PORT TAMPA—KEY WEST—HAVANA LINE.

Between	One Way.	Round Trip.
Port Tampa and Havana	$25.40	$42.10
Key West and Port Tampa	12.90	21.10
Key West and Havana	12.50	21.00

The above rates include meals and berth while at sea.

SOUTHERN PACIFIC STEAMERS.

NEW ORLEANS AND HAVANA SERVICE.

Fares between New Orleans and Havana.

First cabin	$25.00
Round trip, either direction	45.00
Steerage	12.50

TRINIDAD LINE.

NEW YORK, GRENADA AND TRINIDAD, B.W.I.

Trinidad or Grenada—first class	$50.00
Trinidad or Grenada—excursion	90.00

QUEBEC S.S. CO., LTD.

NEW YORK TO BERMUDA AND WINDWARD ISLANDS.

Bermuda Service.

Cabin passage, round trip, $25 and up, according to steamer and date of sailing. (Subject to change.) Steerage passage, $15; excursion, $18. Alien Tax $4 additional.

West India Service.

New York to St. Thomas, St. Croix, St. Kitts, Antigua, Guadeloupe, Dominica, Martinique, St. Lucia, Barbados and Demerara.

Cabin passage, $50 to $80. Return tickets, good for 6 months, $90 to $150. Steerage $27.50 to $32.50. U.S. Alien Tax $4 additional.

RED "D" LINE.

TO PUERTO RICO AND VENEZUELA, NEW YORK TO LA GUAYRA, PUERTO CABELLO, CURACAO AND MARACAIBO.

S.S. "CARACAS" AND "PHILADELPHIA"

	1st Class Upper Deck	1st Class Saloon Deck	3d Class
New York and San Juan	$40.00	$35.00	$20.00
New York and La Guayra by most direct route	65.00	60.00	30.00
New York and Curacao	65.00	60.00	30.00
New York to Puerto Cabello	70.00	65.00	35.00
La Guayra and New York (via Puerto Cabello)	75.00	70.00	40.00
Puerto Cabello to New York	65.00	60.00	30.00

S.S. "ZULIA" AND S.S. "MARACAIBO"

	1st Class	2d Class
New York and Mayaguez	$35.00	$25.00
New York to La Guayra	60.00	40.00
New York and Curacao	60.00	40.00
New York and Maracaibo	75.00	50.00

No second class passengers carried on the S.S. "Caracas," "Philadelphia," or "Merida."

Round trip 10 per cent. reduction. Good for 12 months.

THE ROYAL MAIL STEAM PACKET COMPANY.

NEW YORK AND SOUTHAMPTON VIA CUBA, JAMAICA, COLON, CARTAGENA, PUERTO COLOMBIA (SAVANILLA), TRINIDAD (TRANSFER HERE FOR VENEZUELA, BRITISH GUIANA AND WINDWARD AND LEEWARD ISLANDS), BARBADOS, ST. MICHAELS (AZORES) AND CHERBOURG, RETURNING TO NEW YORK BY SAME ROUTE REVERSED.

New York to	First Class Single	First Class Return	Second Class Single	Second Class Return
Antilla (Cuba)	$42.50	$80.75	$30.00	$57.00
Kingston	45.00	85.50	30.00	57.00
Colon	75.00	142.50	45.00	85.50
Cartagena	80.00	152.00	45.00	85.50
Puerto Colombia (Savanilla)	80.00	152.00	45.00	85.50
Trinidad	85.00	153.00	55.00	99.00
Barbados	90.00	162.00	60.00	108.00
Cherbourg	175.00	300.00	125.00	200.00
Southampton	200.00	350.00		

CUBA.

Santiago and Camaguey, $45 first class, $30 second class; Havana, $55 first class; Havana via Santiago, $58.50 first class.

BERMUDA. SERVICE

New York to Bermuda, first class, round trip, $25 and up.

RATES TO WEST INDIAN AND SOUTH AMERICAN PORTS—Continued.

United Fruit Company.

NEW YORK—JAMAICA—PANAMA—COSTA RICA AND COLOMBIA SERVICES.

Per Adult Between New York and	First Cabin. One Way.	Round Trip.
Kingston	$45.00	$85.50
Colon	75.00	142.50
Cartagena	80.00	152.00
Puerto Colombia	80.00	152.00
Santa Marta	80.00	152.00
Limon	80.00	152.00

BETWEEN PHILADELPHIA AND PORT ANTONIO, JAMAICA.

	One Way.	Round Trip.
First cabin	$35.00	$60.00

BOSTON—COSTA RICA SERVICE.

Fare, Boston to Limon, one way, $60.00; round trip, $114.00.

NEW ORLEANS—GUATEMALA—COSTA RICA—PANAMA SERVICE.

	One Way Cabin 1st Class	Round Trip Cabin 1st Class
Between New Orleans and Belize, British Honduras	$25.00	$45.00
Between New Orleans and Livingston, Guatemala	30.00	37.00
Between New Orleans and Barrios, Guatemala	30.00	57.00
Between New Orleans and Cortez, Spanish Honduras	30.00	57.00
Between New Orleans and Limon, Costa Rica	50.00	95.00
Between New Orleans or Mobile and Bocas del Toro, Panama	50.00	95.00
Between New Orleans and Colon, Panama	50.00	95.00

RATES TO PACIFIC AND TRANS-PACIFIC PORTS.

CANADIAN-AUSTRALASIAN ROYAL MAIL LINE.

From VANCOUVER, B. C., To	One-Way Fares. First Class.	Servants Accompanying Families.	Second Class.	Steerage.	Round-Trip Fares. First Class. Six Months.	First Class. Twelve Months.	Second Class. Twelve Months.
HONOLULU, Hawaiian Islands	$75.00	$50.00	$50.00	$30.00	$125.00	......	$100.00
SUVA, Fiji Islands	200.00	133.00	125.00	60.00	......	$300.00	200.00
AUCKLAND, New Zealand	200.00	133.50	125.00	60.00	......	300.00	200.00
SYDNEY, New South Wales	200.50	133.50	125.00	60.00	......	300.00	200.00
BRISBANE, Queensland, via Sydney and rail	213.00	146.40	133.50	60.50	......	319.00	213.00
" " via Sydney and steamer	215.35	148.85	140.85	65.10	......	325.55	226.55
ROCKHAMPTON, Queensland, via Sydney and steamer	226.00	160.40	151.00	71.55	......	340.00	240.50
MELBOURNE, Victoria, via Sydney and rail	213.15	146.65	134.75	60.75	......	319.50	214.00
" " via Sydney and Interstate steamer	212.75	146.25	137.75	65.10	......	320.45	220.45
ADELAIDE, South Australia, via Sydney and rail	219.50	153.50	137.20	62.00	......	300.20	219.55
" " via Sydney and Interstate steamer	223.00	156.50	148.00	60.20	......	335.75	235.75
FREMANTLE, West Australia, via Sydney and Interstate steamer	251.10	184.00	176.10	105.55	......	376.00	276.55
ALBANY, West Australia, via Sydney and Interstate steamer	251.10	184.00	176.10	105.55	......	376.00	276.00
HOBART, Tasmania, via Sydney and steamer	212.00	145.55	137.85	67.85	......	318.45	218.45
APIA, Samoan Islands, via Suva and steamer	200.00	133.50	125.65	60.00	......	300.00	200.00
WELLINGTON, New Zealand, via Auckland and steamer	213.85	147.00	138.50	65.25	......	325.00	200.00
PORT LYTTLETON (Christ Church), New Zealand, via Auckland and steamer	219.45	151.95	143.45	61.55	......	300.15	200.15
DUNEDIN, New Zealand, via Auckland and steamer	223.00	156.55	143.20	65.65	......	337.25	237.25

UNION STEAMSHIP CO. OF NEW ZEALAND. (Ltd.)

From SAN FRANCISCO, CAL., To	One-Way Fares. First Cabin.	Second Cabin.	Third Cabin.	Round-Trip Fares. First Cabin. Four Months.	Second Cabin. Four Months.
PAPEETE, Tahiti	$100.00	$63.00	$40.00	$125.00	$110.00
RAROTONGA, Cook Islands	123.50	78.75	58.75	175.00	142.55
APIA, Samoan Islands, via Auckland and steamer	247.00	⊗180.50	107.20	368.75	⊗318.75
SUVA, Fiji Islands, via Auckland and steamer	237.00	⊗179.50	90.50	378.75	⊗306.75
AUCKLAND, New Zealand, via Wellington	194.50	137.20	75.50	300.75	213.75
WELLINGTON, New Zealand	178.75	121.25	75.50	267.50	187.50
PORT LYTTLETON, (Christ Church), New Zealand, via Wellington	184.00	128.50	78.50	276.75	156.75
DUNEDIN, New Zealand, via Wellington	190.25	131.75	82.20	285.00	200.00
HOBART, Tasmania, via Wellington	213.75	138.75	80.25	322.00	222.20
SYDNEY, New South Wales, via Wellington and steamer	200.00	125.00	80.00	300.20	200.20
BRISBANE, Queensland, via Sydney and rail	213.25	133.75	83.75	319.50	213.00
MELBOURNE, Victoria, via Sydney and rail	213.25	134.75	80.50	312.50	214.75
ADELAIDE, South Australia, via Sydney and rail	219.50	137.75	82.75	329.25	219.50
FREMANTLE, West Australia, via Sydney and rail	255.00	160.50	107.50	382.75	200.00

⊗First cabin on steamship beyond Auckland, New Zealand.

RATES TO PACIFIC AND TRANS-PACIFIC PORTS—Continued.

NIPPON YUSEN KAISHA (Japan Mail Steamship Co.).

From SEATTLE, WASH., To	ONE-WAY FARES. First Class.	Servants Accompanying Families: Other than Asiatic.	Servants Accompanying Families: Asiatic.	Second Class.	Asiatic Steerage.	ROUND-TRIP FARES. First-Class: Six Months	First-Class: Twelve Months	Servants Accompanying Families, Other than Asiatic: Four Months.	Other than Asiatic: Twelve Months.	Asiatic: Twelve Months	Second Class: Four Months.	Second Class: Twelve Months.
YOKOHAMA, Japan	$110.00	⊗	⊗	⊕$75.00	$43.50	$185.00	$192.50	⊗	⊗	⊗	⊗	⊗
KOBE, Japan	110.00	⊗	⊗	⊕ 75.00	43.50	165.00	192.50	⊗	⊗	⊗	⊗	⊗
MOJI, Japan	115.00	⊗	⊗	⊕ 80.00	43.50	172.50	201.25	⊗	⊗	⊗	⊗	⊗
NAGASAKI, Japan	115.00	⊗	⊗	⊕ 80.00	43.50	172.50	201.25	⊗	⊗	⊗	⊗	⊗
SHANGHAI, China	125.00	⊗	⊗	⊕ 85.00	43.50	187.50	218.75	⊗	⊗	⊗	⊗	⊗
HONG KONG	125.00	⊗	⊗	⊕ 85.00	43.50	187.50	218.75	⊗	⊗	⊗	⊗	⊗
MANILA, Philippine Islands, via Hong Kong	150.00	⊗	⊗	⊕108.50	43.50	225.00	200.50	⊗	⊗	⊗	⊗	⊗

⊕Fares will *not* apply via steamships *Yokohama Maru* or *Shidzuoka Maru*.
⊗Canceled; no fare in effect.

BANK LINE (Ltd.)

From SEATTLE OR TACOMA, WASH., OR VANCOUVER, B. C., To	ONE-WAY FARES. First Cabin.	Servants Accompanying Families: Other than Asiatic.	Servants Accompanying Families: Asiatic.	Asiatic Steerage.	ROUND-TRIP FARES. First Cabin: Four Months.	First Cabin: Twelve Months.	Servants Accompanying Families, Other than Asiatic: Four Months.	Other than Asiatic: Twelve Months.	Asiatic: Twelve Months.
YOKOHAMA, Japan	$120.00	$85.00	$42.50	$43.50	$150.50	$175.00	$127.50	$150.00	$85.00
KOBE, Japan	124.00	87.50	42.50	43.50	156.20	182.50	132.50	152.50	85.00
MOJI, Japan	100.50	90.00	42.50	43.50	150.75	186.46	135.20	157.50	90.00
NAGASAKI, Japan, via Kobe	116.33	86.20	42.50	43.50	165.00	192.50	145.00	167.50	85.00
SHANGHAI, China	115.00	100.20	42.50	47.50	172.50	201.25	150.00	175.00	85.00
HONG KONG	115.00	105.00	42.50	47.50	172.50	201.25	157.50	185.00	85.00
MANILA, Philippine Islands	115.00	105.00	42.50	47.50	172.50	201.25	157.50	185.00	85.00

OCEAN STEAMSHIP CO. (Ltd.) AND CHINA MUTUAL STEAM NAVIGATION CO. (Ltd.)

From SEATTLE OR TACOMA, WASH., OR VANCOUVER, B. C., To	ONE-WAY FARES. Asiatic Steerage.
YOKOHAMA, Japan	$43.50
KOBE, Japan	43.50
MOJI, Japan	43.50
NAGASAKI, Japan	43.50
SHANGHAI, China	51.00
HONG KONG	51.86
MANILA, Philippine Islands	51.00

MATSON NAVIGATION CO.

From SAN FRANCISCO, CAL., To	ONE-WAY FARES. First Class.	Servants Accompanying Families.	Mixed Class.	Steerage.	ROUND-TRIP FARES. First Class. Six Months.
HONOLULU, Hawaiian Islands	$65.00	$50.00	......	$30.00	$110.00
SUVA, Fiji Islands, via Honolulu and Canadian-Australasian Royal Mail Line	180.00	....	⊕$142.50	......	....
AUCKLAND, New Zealand, via Honolulu and Canadian-Australasian Royal Mail Line	200.00	....	⊕145.00	......	....
SYDNEY, New South Wales via Honolulu and Canadian-Australasian Royal Mail Line	200.00	....	⊕145.00	......	....
BRISBANE, Queensland, via Sydney and rail	212.90	....	⊕153.55	......	....
MELBOURNE, Victoria, via Sydney and rail	213.15	....	⊕154.75	......	....
ADELAIDE, South Australia, via Sydney and rail	219.50	....	⊕157.90	......	....

⊕First class to Honolulu and second class beyond.

RATES TO PACIFIC AND TRANS-PACIFIC PORTS—Continued.

PACIFIC MAIL STEAMSHIP CO. OR TOYO KISEN KAISHA.

From SAN FRANCISCO, CAL., To	ONE-WAY FARES. First Class	Servants Accompanying Families: Other Than Asiatic	Servants Accompanying Families: Asiatic	Intermediate	Second Class	Asiatic Steerage
HONOLULU, Hawaiian Islands, via Pacific Mail Steamship Co. only	$75.00 85.90	$50.00	$30.00	$65.00	$30.00	$30.00
①YOKOHAMA, Japan	200.50	133.85	50.50	150.00	70.00	51.00
①KOBE, Japan	207.50	138.85	50.00	157.50	74.00	51.50
①NAGASAKI, Japan	222.50	148.25	50.00	171.00	80.50	51.90
①SHANGHAI, China	225.50	150.50	50.00	175.00	85.50	51.00
①HONG KONG	225.00	150.00	50.90	175.85	85.00	51.90
①MANILA, Philippine Islands, via Nagasaki direct or Hong Kong	225.00	150.00	50.00	175.00	85.00	51.00

From SAN FRANCISCO, CAL., To	ROUND-TRIP FARES. First Class: Six Months	First Class: Twelve Months	First Class: Servants Accompanying Families, Other Than Asiatic: Six Months	Other Than Asiatic: Twelve Months	Asiatic: Six Months or Twelve Months	Intermediate: Six Months	Mixed Class: Six Months	Mixed Class: Twelve Months	Mixed Class: Servants Accompanying Families: Six Months	Servants Accompanying Families: Twelve Months
HONOLULU, Hawaiian Islands, via Pacific Mail Steamship Co. only	$135.90 110.88	......	$30.00	....	$90.00	$110.00	....	....	....	....
①YOKOHAMA, Japan	300.00	$350.90	300.30	$333.85	190.85	225.50	$302.55	$302.30	$300.00	$338.40
①KOBE, Japan	312.50	365.30	300.35	348.35	100.30	238.35	274.48	298.00	308.35	308.40
①NAGASAKI, Japan	334.00	383.75	333.70	300.50	190.00	256.50	298.85	315.30	333.70	338.15
①SHANGHAI, China	337.50	383.75	335.00	333.50	133.00	262.50	300.30	342.65	335.50	355.15
①HONG KONG	337.50	383.75	335.30	362.50	100.30	262.50	300.30	342.85	335.30	355.15
①MANILA, Philippine Islands, via Nagasaki direct or Hong Kong	337.50	383.75	335.00	300.50	100.00	262.50	300.50	342.65	335.00	355.15

①In constructing through fares via San Francisco and Pacific Mail Steamship Co. or Toyo Kisen Kaisha, the following deductions will be made from the one-way and round-trip basing fares of the Steamship lines named to all points, except Honolulu, as shown above:

Deduct $2.85 when one-way first-class limited or 30 day railway tickets and $2.20 when excursion railway tickets are issued from New York to San Francisco.

Deduct $1.75 when one-way mixed-class railway tickets are issued from New York to San Francisco.

Deduct $2.70 when one-way first-class limited or 30 day railway tickets and $2.20 when excursion railway tickets are issued from Philadelphia to San Francisco.

Deduct $1.60 when one-way mixed-class railway tickets are issued from Philadelphia to San Francisco.

Deduct $1.60 (except via Cincinnati and Chicago) and $1.80 via Cincinnati and Chicago when one-way first-class limited or 30 day railway tickets and $1.45 when excursion railway tickets are issued from Baltimore to San Francisco.

Deduct 50 cents (except via Cincinnati and Chicago) and 70 cents via Cincinnati and Chicago when one-way mixed-class railway tickets are issued from Baltimore to San Francisco.

Deduct $1.60 when one-way first-class limited or 30 day railway tickets and $1.45 when excursion railway tickets are issued from Washington to San Francisco.

Deduct 80 cents when one-way mixed-class railway tickets are issued from Washington to San Francisco.

No deductions will be made on variable route excursion railway tickets to San Francisco in one direction either going or returning via Portland, Seattle, Tacoma, Vancouver, or Victoria.

Fares apply only via steamships *Korea*, *Manchuria*, *Mongolia*, or *Siberia*.

Fares apply only for inside rooms, saloon deck, via steamships *Korea*, *Manchuria*, *Mongolia*, or *Siberia*.

Fares apply only via steamship *China*.

Fares apply only via steamships *China*, *Nile*, or *Persia* of Pacific Mail S.S. Co. or *Nippon Maru* of Toyo Kisen Kaisha.

Fares apply going first-class via steamships *Korea*, *Manchuria*, *Mongolia*, or *Siberia* of Pacific Mail S.S. Co. or *Chiyo Maru*, *Shinyo Maru*, or *Tenyo Maru* of Toyo Kisen Kaisha, and returning intermediate via steamships *China*, *Nile*, or *Persia* of Pacific Mail S.S. Co. or *Nippon Maru* of Toyo Kisen Kaisha, or vice versa.

OCEANIC STEAMSHIP CO.

From SAN FRANCISCO, CAL., To	ONE-WAY FARES. First Class.	Second Class.	Third Class.	ROUND-TRIP FARES. First Class: Six Months.	First Class: Twelve Months.	Second Class: Twelve Months.
HONOLULU, Hawaiian Islands	$85.90	......	$30.00	$118.90	....	....
PAGO PAGO, Samoan Islands	100.00	$110.00	80.00	....	$240.00	$165.00
SYDNEY, New South Wales	200.00	125.00	80.00	....	300.00	200.00
BRISBANE, Queensland, via Sydney and rail	213.00	133.75	88.75	....	319.50	212.00
MELBOURNE, Victoria, via Sydney and rail	213.25	134.75	88.75	....	310.50	214.75
AUCKLAND, New Zealand, via Sydney and steamer	213.25	133.25	87.75	....	319.75	219.75
WELLINGTON, New Zealand, via Sydney and steamer	213.25	133.25	87.75	....	319.75	219.75
ADELAIDE, South Australia, via Sydney and rail	210.50	137.75	92.75	....	329.25	219.50
FREMANTLE, West Australia, via Sydney and steamer	255.00	180.90	107.50	....	382.75	263.00
HOBART, Tasmania, via Sydney and steamer	211.00	133.20	90.50	....	317.50	217.50
PORT LYTTLETON (Christ Church), New Zealand, via Sydney and steamer	217.50	142.50	91.20	....	329.50	223.50
DUNEDIN, New Zealand, via Sydney and steamer	222.00	147.20	98.25	....	335.20	225.25

First class on steamer beyond Sydney, New South Wales.

Fares will *not* apply for females on steamships *Sonoma* or *Ventura*.

CANADIAN PACIFIC RY. CO.'S ROYAL MAIL STEAMSHIP LINE.

From VANCOUVER, B. C., To	ONE-WAY FARES. First Class.	Servants Accompanying Families. Other Than Asiatic.	Servants Accompanying Families. Asiatic.	Intermediate.	Asiatic Second Class.	Asiatic Steerage.	
YOKOHAMA, Japan	$300.00	$133.35	$50.00	$125.00	$70.00	$51.00	$43.50
KOBE, Japan	307.50	133.35	50.00	132.50	74.00	51.00	42.50
MOJI, Japan	....	....	50.00	146.00	80.00	....	43.50
NAGASAKI, Japan	322.50	148.35	50.00	....	80.00	51.00	....
SHANGHAI, China	325.00	150.00	50.00	150.00	85.00	51.00	51.50
HONG KONG	325.00	150.00	50.00	150.00	85.00	51.00	51.00
MANILA, Philippine Islands, via Hong Kong	325.00	150.00	50.00	150.00	85.00	51.00	51.00

From VANCOUVER, B. C., To	ROUND-TRIP FARES. First Class. Six Months.	First Class. Twelve Months.	Servants Accompanying Families. Other Than Asiatic. Six Months.	Other Than Asiatic. Twelve Months.	Asiatic. Six Months or Twelve Months.	Intermediate Six Months.	Mixed Class. Six Months.	Mixed Class. Twelve Months.
YOKOHAMA, Japan	$300.00	$350.00	$200.00	$233.35	$100.00	$187.50	$225.00	$261.00
KOBE, Japan	312.00	365.00	208.35	243.35	100.00	196.75	236.00	261.40
MOJI, Japan	....	....	....	....	100.00	219.00	257.75	278.40
NAGASAKI, Japan	334.00	388.75	222.70	262.50	100.00	....	257.75	278.40
SHANGHAI, China	337.50	393.75	225.00	262.50	100.00	225.00	262.50	305.15
HONG KONG	337.50	393.75	225.00	262.50	100.00	225.00	262.50	305.15
MANILA, Philippine islands, via Hong Kong	337.50	393.75	225.00	262.50	100.00	225.00	262.50	305.15

Fares apply only via steamships *Empress of India* or *Empress of Japan*.
Fares apply only via steamship *Monteagle*.
Fares apply via steamships *Empress of India*, *Empress of Japan*, or *Monteagle*.
Fares apply going first class via steamships *Empress of India* or *Empress of Japan*, and returning intermediate via steamship *Monteagle*, or vice versa.
Fares apply going first class via steamships *Empress of India* or *Empress of Japan* to Nagasaki, and returning intermediate via steamship *Monteagle* from Moji, or vice versa. Passengers must provide for their own transportation between Nagasaki and Moji.

DEPTHS OF PORTS OF THE WORLD.

Port.	Channel (mean high water). Feet.	Quay (mean high water). Feet.	Port.	Channel (mean high water). Feet.	Quay (mean high water). Feet.
Amsterdam (canal) Holland	30	30	Libau, Russia	22	29
Antwerp, Belgium	37	37	Liverpool, England	55	33
Baltimore, Md	31	31	London, England	42	43
Boston, Mass	36	36	Manchester Ship Canal	28	28
Boulogne, France	29	34	Marseille, France	55	39
Bremen, Germany	18	18	Montreal, Canada	30	35
Bremerhaven, Germany	34	34	Naples, Italy	33	30
Brindisi, Italy	32	32	New Orleans, La	30	40
Cherbourg, France	42	50	New York, N. Y	42	50
Copenhagen, Denmark	26	26	Norfolk, Va	30	30
Dieppe, France	34	34	Ostend, Belgium	31	38
Galveston, Tex	30	28	Philadelphia, Pa	29	32
Genoa, Italy	60	33	Portland, Me	38	38
Glasgow, Scotland	30	38	Rotterdam, Holland	29	29
Greenock, Scotland	36	39	St. Johns, Newfoundland	48	54
Halifax, Nova Scotia	83	45	San Francisco, Cal	39	39
Hamburg, Germany	32	35	Seattle, Wash	(*)	30 to 50
Havre, France	42	30	Southampton, England	41	43
Kaiser William Canal, Germany	29	....	Stettin, Germany	23	23
Key West, Fla	30	30	Stockholm, Sweden	25	22
Königsberg Canal, Ger	21	....	Suez Canal, Egypt	28	....
Leghorn, Italy	22	26	Toulon, France	†26	†23
			Trieste, Austria	30	28

* Deep water.

FROM STEAM PACKET TO STEAM PALACE.

(1) Wood Paddle-boats. (3) Iron Screw Steamers. (5) Steel Twin-Screw Steamers.
(2) Iron " (4) Steel " "

Date	Name of Steamer.	Owners.	Remarks.
1833	Royal William. . . (1)	Quebec & Halifax S.N.Co.	From Pictou (N.S.), 1st to cross the Atlantic.
1838	Sirius.	British and Amer.S.N.Co. .	From Cork, 1st departure from U. K.
"	Great Western.	Great Western S.N.Co. . . .	" Bristol, 1st built for Atlantic.
"	Royal William. . . . . (2)	Transatlantic SS. Co.	" Liverpool, 1st departure.
1840	Britannia.	Cunard Line	" Liverpool, 1st carried British mails.
1849	Atlantic.	Collins "	" New York, 1st carried U.S. mails.
1854	Canadian.	Allan "	" Glasgow, 1st steamer of Line.
1856	Tempest.	Anchor "	" " 1st " "
"	Borussia.	Hamburg-American Line .	" Hamburg, 1st " "
"	Adriatic.	Collins Line.	Last Sailing of Line.
1858	Bremen.	Norddeutscher Lloyd.	From Bremen to New York.
1856	Persia . . . . (2)	Cunard.	1st Cunard iron paddle steamer.
1862	Scotia.	"	Last " " " "
1845	Great Britain. . . . (3)	Great Western S.N.Co. . . .	1st Atlantic iron screw steamer.
1850	City of Glasgow.	Inman Line.	1st to carry steerage passengers.
1858	GREAT EASTERN. . . .	. . . .	Paddle wheels and propeller.
1868	Italy.	National Line.	1st Atlântic ss. with comp. engines.
1869	City of Brussels. . . .	Inman "	1st " " " steam steering gear.
1871	Oceanic (1st).	White Star Line	1st with'midship saloon, &c.
1873	Pennsylvania.	American "	1st sailing of Line to Liverpool.
1874	Britannic.	White Star "	1st to exceed 5,000 tons, Great Eastern [excepted.
1875	City of Berlin.	Inman "	1st with electric light.
1879	Arizona.	Guion. . "	Watertight compartments floated her.
1882	Alaska.	" "	1st "ocean greyhound."
1883	Oregon.	" " (1). . . . . . Cunard " (2).	Sunk outside New York; every one saved by N. D. Lloyd ss. Fulda.
1879	Buenos Ayrean. . (4)	Allan Line.	1st Atlantic steel steamer.
1881	Servia.	Cunard "	1st Cunard " "
"	City of Rome.	Inman (1) Line . . . . Anchor (2) "	Fitted with three funnels.
1884	America.	National "	1st and last express ss. of Line.
"	Umbria. . . . . Etruria.	Cunard "	1st with 20 knots speed.
1886	Aller.	Norddeutscher Lloyd.	1st triple-expansion express ss.
1888	City of New York (5) City of Paris.	Inman & International (1) American Line (2)	1st twin-screw ocean expresses. 1st to exceed 10,000 tons, G.E. excepted
1889	Teutonic. . . . . Majestic.	White Star Line.	Designed as mercantile cruisers.
1890	Fürst Bismarck.	Hamburg-American Line .	1st under 6½ days from Southampton.
1892	La Touraine.	Compagnie Générale Trans.	Record Havre to New York, 6¾ days.
1893	Campania. . . . . . . Lucania.	Cunard Line.	Lucania: highest day's run 562 knots. Liverpool to New York records.
1895	St. Paul. . . . . St. Louis.	American.	Largest express steamers ever built in America.
1897	Kaiser Wilhelm d. Gr.	Norddeutscher Lloyd. . . .	Record day's run, 580 knots.
1899	Oceanic.	White Star Line.	Balanced engines, 1st to exceed 15,000 [tons.
1900	Deutschland.	Hamburg-American Line. .	Fastest ocean steamer in the world.
1901	CELTIC.	White Star Line.	1st to exceed 20,000 tons.
1902	KRONPRINZ WILHELM	Norddeutscher Lloyd.	
1903	Kaiser Wilhelm II. .	Norddeutscher Lloyd.	Largest express steamer in the world.
1904	Baltic.	White Star Line.	Largest ss. in the world—726x76x49.
"	Victorian.	Allan Line.	1st fitted with turbine engines.
1907	Lusitania.	Cunard Line.	Fastest in the world. Fitted with turbine engines. Record day's run, Mauretania, 676 knots.
"	Mauretania.	" "	
1911	Olympic	White Star Line	
1913	Imperator	Hamburg-American Line.	This is the largest vessel in the world.

Courtesy of "The Sphere."

IF ONLY WE COULD FLY THE ATLANTIC.

ONE WAY BY WHICH THE ICEBERG DANGER WOULD BE AVOIDED.

This diagram tells its own story of how we have conquered time and space. The problem of flying to America is now well within the bounds of possibility.

STEAMSHIP RECORDS.

Compiled and Revised by A. W. Lewis, Chief of the Ship News of the "Associated Press."

QUEENSTOWN RECORDS SINCE 1880.

WESTWARD.

Date.	Steamer.	Line.	d.	h.	m.
1880	Arizona	Guion	7	10	47
1882	Alaska	Guion	7	6	43
1884	Oregon	Cunard	6	9	42
1885	Etruria	Cunard	6	5	31
1887	Umbria	Cunard	6	4	42
1888	Etruria	Cunard	6	1	55
1889	City of Paris	Inman	5	19	18
1891	Majestic	White Star	5	18	8
1891	Teutonic	White Star	5	16	31
1892	City of Paris	American	5	14	24
1894	Campania	Cunard	5	9	27
1894	Lucania	Cunard	5	7	23
1895	Campania	Cunard	5	9	6
1898	Etruria	Cunard	5	20	55
1907	Lusitania	Cunard	4	18	40
1907	Mauretania	Cunard	5	0	55
1908	Lusitania	Cunard	4	15	0
1909	Mauretania	Cunard	4	15	55
1909	Lusitania	Cunard	4	11	*42
1909	Mauretania	Cunard	4	10	51
1910	Mauretania	Cunard	4	10	*41

QUEENSTOWN RECORDS SINCE 1882.

EASTWARD.

1882	Alaska	Guion	6	18	37
1884	America	National	6	14	8
1884	Oregon	Cunard	6	11	9
1887	Etruria	Cunard	6	4	36
1889	City of Paris	Inman	5	23	38
1889	City of Paris	Inman	5	22	50
1891	Teutonic	White Star	5	21	3
1892	City of New York	American	5	19	57
1893	Campania	Cunard	5	17	27
1893	Campania	Cunard	5	14	55
1893	Campania	Cunard	5	12	7
1893	Lucania	Cunard	5	13	30
1894	Campania	Cunard	5	9	18
1894	Lucania	Cunard	5	13	11
1894	Lucania	Cunard	5	8	38
1907	Lusitania	Cunard	4	22	50
1907	Mauretania	Cunard	4	22	29
1908	Lusitania	Cunard	4	22	43
1909	Mauretania	Cunard	4	17	21
1909	Mauretania	Cunard	*4	13	41
1909	Lusitania	Cunard	4	15	52
1911	Lusitania	Cunard	*4	15	50

SOUTHAMPTON RECORDS SINCE 1890.

EASTWARD.

1890	Columbia	Hamburg American	6	15	0
1893	Fürst Bismarck	Hamburg American	6	10	55
1897	St. Louis	American	6	10	14
1897	Kaiser Wilhelm der Grosse,	North German Lloyd.	5	17	8

SOUTHAMPTON RECORDS SINCE 1892

WESTWARD.

1892	Lahn	North German Lloyd	6	22	0
1893	Paris	American	6	9	37
1894	New York	American	6	7	14
1896	St. Louis	American	6	2	24
1896	St. Paul	American	6	0	31
1897	Kaiser Wilhelm der Grosse	(North German Lloyd)	5	22	35
1898	Kaiser Wilhelm der Grosse	(North German Lloyd)	5	20	10
1910	Kaiser Wilhelm II		5	18	48

RECORD OF S. S. MAURETANIA.

(Cunard Line.)

WESTWARD.

Date.		d.	h.	m.
1907, Dec.	From Queenstown	5	0	55
1909, July	From Queenstown	4	15	55
1909, Sept.	From Queenstown	4	10	51
1910, Sept.	From Queenstown	4	10	*41

* Record.

EASTWARD.

1907, Dec.	To Queenstown	4	22	29
1909, June	To Queenstown	4	17	21
1909, Sept.	To Queenstown	4	13	*41

RECORD OF S. S. LUSITANIA.

(Cunard Line.)

WESTWARD.

1907, Nov.	From Queenstown	4	18	40
1908, Aug.	From Queenstown	4	15	0
1909, Sept.	From Queenstown	4	11	*42

* Record.

EASTWARD.

1907, Nov.	To Queenstown	4	22	50
1908, Oct.	To Queenstown	4	22	43
1909, Oct.	To Queenstown	4	15	52
1911, Jan.	To Queenstown	4	15	*50

RECORD OF S. S. KRONPRINZESSIN CECILIE.

(North German Lloyd Line.)

WESTWARD.

1908, Jan.	From Cherbourg	5	16	0
1908, Aug.	From Cherbourg	5	11	9
1910, Sept.	From Cherbourg	5	10	*23

EASTWARD.

1907, Aug.	To Plymouth	5	11	5
1908, Sept.	To Plymouth	5	8	7
1909, Sept.	To Plymouth	5	7	*25

RECORD OF S. S. LA PROVENCE.

French Line.)

WESTWARD.

1906, April	From Havre (first trip)	6	9	10
1906, May	From Havre	6	3	35
1906, July	From Havre	6	3	10
1906, Sept.	From Havre	6	2	15
1907, Sept.	From Havre	6	1	*3

EASTWARD.

1906, May	To Havre	6	4	40
1906, June	To Havre	6	2	*48

RECORD OF S. S. FRANCE.

(French Line.)

WESTWARD.

1912, Apl. 26	From Havre (First trip)	6	2	31
1912, May	From Havre	5	23	58
1912, Aug.	From Havre	5	22	46
1912, Sept.	From Havre	5	22	0

EASTWARD.

1912, May	To Havre (First trip east)	5	20	2
1912, Aug.	To Havre	5	16	48

RECORD OF S. S. KAISER WILHELM II.

(North German Lloyd Line.)

WESTWARD.

1903, April	From Cherbourg	5	23	0
1903, Aug.	From Cherbourg	5	15	10
1904, Nov.	From Cherbourg	5	12	25
1909, Nov.	From Cherbourg	5	12	*8

EASTWARD.

1903, May	To Plymouth	6	1	30
1903, Aug.	To Plymouth	5	10	42
1904, Oct.	To Plymouth	5	8	*20

* Record.

STEAMSHIP RECORDS—Continued.

RECORD OF S. S. KRONPRINZ WILHELM.
(North German Lloyd Line.)

WESTWARD.

Date		d.	h.	m.
1901, Sept.	From Cherbourg (First trip)	6	10	15
1901, Oct.	From Cherbourg	5	21	10
1901, Nov.	From Cherbourg	5	19	6
1901, Dec.	From Cherbourg	5	15	45
1902, Sept.	From Cherbourg	5	11	*57

EASTWARD.

Date		d.	h.	m.
1901, Oct.	To Plymouth	5	9	48
1901, Nov.	To Plymouth	5	8	*18

RECORD OF THE OLD S. S. DEUTSCHLAND
(Hamburg-American Line.)

WESTWARD.

Date		d.	h.	m.
1900, July	From Plymouth (First Trip)	5	16	24
1900, Sept.	From Cherbourg	5	12	29
1901, Aug.	From Cherbourg	5	12	23
1903, Sept.	From Cherbourg	5	11	54

EASTWARD.

Date		d.	h.	m.
1900, July	To Plymouth	5	15	6
1900, Aug.	To Plymouth	5	11	45
1900, Sept.	To Plymouth	5	7	38
1900, Sept.	To Cherbourg via Plymouth	5	13	30

Her speedy machinery has been removed and she is now a superb cruising yacht of comparatively low speed and is the "Victoria Luise."

RECORD OF S. S. "IMPERATOR."

WESTWARD.

Date		d.	h.	m.
1913, June	From Cherbourg (First trip)	6	5	14
1913, July	From Cherbourg	5	21	30
1913, Aug.	From Cherbourg	5	19	8

EASTWARD.

Date		d.	h.	m.
1913, July	To Plymouth (First trip east)	6	1	28
1913, July	To Plymouth	5	18	24

RECORD OF S. S. KAISER WILHELM DER GROSSE.
(North German Lloyd Line.)

EASTWARD.

Date		d.	h.	m.
1897, Oct.	To Plymouth	5	15	10
1897, Nov.	To Southampton	5	17	8
1899, July	To Cherbourg	5	20	55
1899, Sept.	To Cherbourg	5	17	56
1900, Jan.	To Cherbourg	5	15	50
1901, Oct.	To Plymouth	5	10	*0

WESTWARD.

Date		d.	h.	m.
1897, Sept.	From Southampton (First Trip)	5	22	35
1898, April	From Southampton	5	20	10
1899, Mar.	From Cherbourg	5	21	8
1899, Sept.	From Cherbourg	5	18	15
1899, Oct.	From Cherbourg	5	17	48
1899, Nov.	From Cherbourg	5	17	37
1901, Oct.	From Cherbourg	5	17	22
1901, Nov.	From Cherbourg	5	16	24
1902, April	From Cherbourg	5	18	45
1902, Sept.	From Cherbourg	5	15	*20

*Record.

RECORD OF S. S. "OLYMPIC."

WESTWARD.

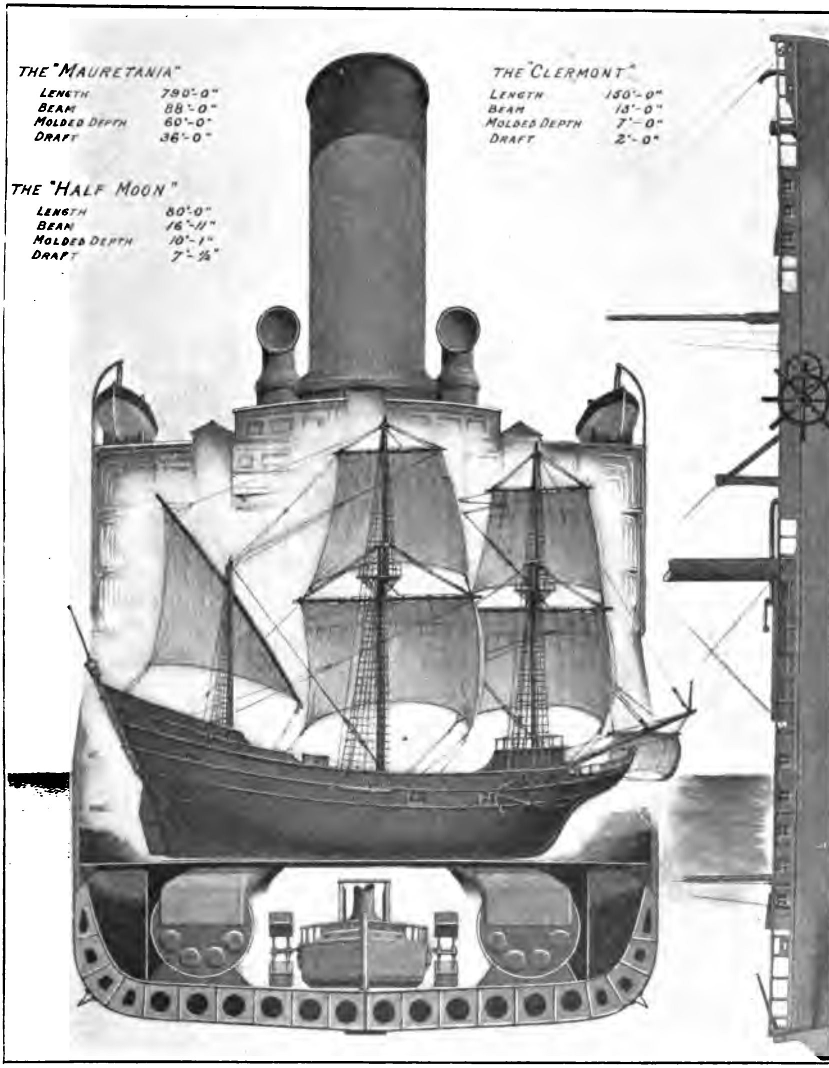
Date		d.	h.	m.
1911, June	From Queenstown (First trip)	5	15	2
1911, July	From Queenstown	5	13	6
1911, Aug.	From Queenstown	5	12	23
1911, Sept.	From Queenstown	5	7	29

EASTWARD.

Date		d.	h.	m.
1911, July	To Plymouth (First trip east)	5	18	30
1911, Aug.	To Plymouth	5	17	46
1911, Sept.	To Plymouth	5	14	32
1911, Dec.	To Plymouth	5	12	16

PROPORTIONAL STEAMSHIP SPEEDS.

Knots.	Miles per Hour.	Feet per Minute.	Feet per Second	Knots.	Miles per Hour.	Feet per Minute.	Feet per Second.
1	1.151	101.333	1.689	13½	15.545	1,368.000	22.800
1½	1.727	152.000	2.533	14	16.121	1,418.666	23.644
2	2.303	202.666	3.378	14½	16.696	1,469.333	24.488
2½	2.879	253.333	4.222	15	17.273	1,520.000	25.333
3	3.454	304.000	5.066	15½	17.848	1,570.666	26.177
3½	4.030	354.666	5.911	16	18.424	1,621.333	27.022
4	4.606	405.333	6.755	16½	19.000	1,672.000	27.866
4½	5.181	456.000	7.600	17	19.575	1,722.666	28.711
5	5.757	506.666	8.444	17½	20.151	1,773.333	29.555
5½	6.333	557.333	9.288	18	20.727	1,824.000	30.400
6	6.909	608.000	10.133	18½	21.303	1,874.666	31.244
6½	7.484	658.666	10.972	19	21.878	1,925.333	32.088
7	8.060	709.333	11.822	19½	22.454	1,976.000	32.933
7½	8.636	760.000	12.666	20	23.030	2,026.666	33.777
8	9.212	810.666	13.511	20½	23.606	2,077.333	34.622
8½	9.787	861.333	14.355	21	24.181	2,128.000	35.466
9	10.363	912.000	15.200	21½	24.757	2,178.666	36.311
9½	10.939	962.666	16.044	22	25.333	2,229.333	37.154
10	11.515	1,013.333	16.888	22½	25.909	2,280.000	37.998
10½	12.091	1,064.000	17.732	23	26.485	2,330.666	38.842
11	12.666	1,114.666	18.577	23½	27.060	2,381.333	39.687
11½	13.242	1,165.333	19.421	24	27.636	2,432.000	40.532
12	13.818	1,216.000	20.266	24½	28.212	2,482.666	41.376
12½	14.394	1,266.666	21.111	25	28.787	2,533.333	42.220
13	14.969	1,317.333	21.955	26	29.938	2,634.666	43.910



THE DEVELOPMENT OF OCEAN VESSELS IN THE PAST THREE CENTURIES.

The "Half Moon" of 1609, if the wind favored, could sail about 6 knots. The "Clermont" of 1807 made 4½ knots. The "Mauretania" in 1909 crossed the Atlantic at a 26-knot gait. The engine and boiler rooms of the Mauretania could accommodate five Clermonts placed end to end. The "Half Moon" could be placed athwartship on the deck above with her hull and masts entirely within the ship's structure.

DISTANCES IN KNOTS OR NAUTICAL MILES.

Short Track—Aug. 24 to Jan. 14, East. Aug. 15 to Jan. 14, West. Long Track—Jan. 15 to Aug. 23, East. Jan. 15 to Aug. 14, West.	EASTBOUND		WESTBOUND	
	Short Track	Long Track	Short Track	Long Track
Ambrose Channel Lightship* and—				
Alexandria, Egypt	4,952	4,962	4,945	4,954
Antwerp	3,323	3,432	3,296	3,389
Azores (Ponta del Gada)	2,227	2,231	2,221	2,230
Bremen	3,563	3,692	3,536	3,629
Brow Head	2,744	2,869	2,717	2,823
Cape Race	998	....	....	....
Cherbourg	3,073	3,182	3,046	3,139
Dover	3,190	3,299	3,163	3,259
Fastnet	2,751	2,876	2,724	2,830
Fire Island Lightship	29	....	....	....
Flushing	3,278	3,387	3,251	3,344
Genoa	4,021	4,031	4,013	4,023
Gibraltar	3,168	3,178	3,160	3,170
Hamburg	3,511	3,621	3,485	3,578
Havre	3,145	3,246	3,110	3,205
Liverpool (Landing Stage)	3,033	3,158	3,015	3,124
Lizard Point	2,929	3,038	2,902	2,995
London (Tilbury Docks)	3,257	3,366	3,230	3,326
Nantucket Lightship	193	....	....	....
Naples	4,116	4,126	4,108	4,118
Needles	3,073	3,182	3,046	3,139
Newfoundland (Banks of)	935	....	....	....
Plymouth	2,978	3,087	2,951	3,047
Queenstown	2,814	2,939	2,787	2,893
Roche's Point	2,810	2,935	2,783	2,889
Rotterdam	3,327	3,436	3,300	3,393
Scilly Islands (Bishop Rock)	2,880	2,989	2,853	2,946
Southampton (Docks)	3,095	3,204	3,068	3,161
Philadelphia to Delaware Breakwater, 88 miles.				
Delaware Breakwater and—				
Antwerp	3,397	3,506	3,379	3,472
Fastnet	2,825	2,950	2,807	2,913
Flushing	3,352	3,461	3,334	3,427
Gravesend	3,335	3,444	3,313	3,409
Liverpool (Landing Stage)	3,116	3,241	3,098	3,204
Lizard Point	3,002	3,111	2,985	3,078
London (Tilbury Docks)	3,336	3,445	3,314	3,410
Nantucket Lightship	277	....	....	....
Newfoundland (Banks of)	1,009	....	....	....
Boston (Dock) to Boston Light, 16 miles.				
Boston Light and—				
Antwerp	3,161	3,280	3,126	3,233
Azores (Ponta del Gada)	2,064	2,078	2,064	2,078
Brow Head	2,583	2,718	2,548	2,668
Gibraltar	3,048	3,062	3,048	3,062
Liverpool (Landing Stage.)	2,882	3,017	2,947	2,967
Queenstown	2,652	2,787	2,617	2,737
Montreal and—				
Antwerp	3,150	3,254	3,150	3,254
Liverpool (Landing Stage)	2,755	2,968	2,755	2,968
London (Tilbury Docks)	3,082	3,186	3,082	3,186
Quebec	155	....	....	....
Portland to—				
Halifax	326	....	....	....
Liverpool	2,862	2,985	2,819	2,935
New Orleans to—				
Liverpool (Landing Stage)	4,465	4,465	4,465	4,465
London (Tilbury Docks)	4,676	4.676	4,676	4,676

*New York (Battery) to Ambrose Channel Lightship, 25 miles.

MARINE DISASTERS.

Among the marine disasters on record that have resulted in the loss of life are:

1860, Feb. 19.—American ship Luna wrecked off Barfleur; about 100 lives lost.

1860, Sept. 8.—Steamer Lady Elgin sunk by collision on Lake Michigan; 287 lives lost.

1863, Feb. 7.—British steamer Orpheus wrecked off coast of New Zealand; about 200 lives lost.

1863, April 27.— Steamer Anglo-Saxon wrecked in fog off Cape Race, N. F.; about 237 lives lost.

1865, Aug. 24.—Emigrant ship Eagle Speed foundered near Calcutta; 265 lives lost.

1866, Jan. 11.—Steamer London, on her way to Melbourne, foundered in the Bay of Biscay; 220 lives lost.

1866, Oct. 3.—Steamer Evening Star from New York to New Orleans, foundered; about 250 lives lost.

1867, Oct. 29—Royal Mail Steamers Rhone and Wye and about fifty other vessels driven ashore and wrecked at St. Thomas, West Indies, by a hurricane; about 1,000 lives lost.

1868, April 9.—Steamer Sea Bird burned on Lake Michigan; 100 lives lost.

1869, Oct. 27.—Steamer Stonewall burned below Cairo, Ill.; 200 lives lost.

1870, Jan. 28.—Inman Line steamer City of Boston, left New York with 117 passengers and was never heard from.

1870, Sept. 7.—British warship Captain foundered off Finisterre; 472 lives lost.

1870, Oct. 19.—Steamer Cambria lost off Inishtrahul; about 170 lives lost.

1871, July 30.—Staten Island ferryboat Westfield exploded in New York Harbor; 100 lives lost.

1873, Jan. 22.—British steamer Northfleet, sunk in collision off Dungeness; 300 lives lost.

1873, Nov. 23.—White Star liner Atlantic wrecked off Nova Scotia; 547 lives lost.

1873, Nov. 23.—French Line steamer Ville du Havre, from New York to Havre, in collision with ship Loch Earn, sank in sixteen minutes; 110 lives lost.

1874, Dec. 26.—Immigrant vessel Cospatrick took fire and sank off Auckland; 476 lives lost.

1875, May 7.—Hamburg mail steamer Schiller wrecked in fog on Scilly Isles; 200 lives lost.

1875, Nov. 4.—American steamer Pacific in collision thirty miles southwest of Cape Flattery; 236 lives lost.

1875, Dec. 6.—Steamer Deutschland wrecked at mouth of the Thames; 157 lives lost.

1877, July 15.—British steamer Eten wrecked off Valparaiso; about 100 lives lost.

1877, Nov.—Steamer Atacama wrecked off Caldera, Chile; 105 lives lost.

1877, Nov. 24.—United States Sloop of War Huron wrecked off North Carolina coast; 110 lives lost.

1878, Jan. 31.—Steamer Metropolis wrecked off North Carolina; 104 lives lost.

1878, March 24.—British training ship Eurydice, a frigate, foundered near the Isle of Wight; 300 lives lost.

1878, Sept. 3.—British iron steamer Princess Alice sunk in collision in the Thames; 700 lives lost.

1878, Nov. 25.—Steamer Pomerania sunk in midnight collision with a bark in the English Channel; 47 lives lost.

1878, Dec. 18.—French steamer Byzantin sunk in collision in the Dardanelles with the British steamer Rinaldo; 210 lives lost.

1879, Dec. 2.—Steamer Borusia sunk off coast of Spain; 174 lives lost.

1880, Jan. 31.—British training ship Atlanta, left Bermuda with 290 men and was never heard from.

1880, Nov. 24.—French steamer Oncle Joseph sank by collision off Spezzia; 250 lives lost.

1881, May 24.—Steamer Victoria capsized in Thames River, Canada; 200 lives lost.

1881, Aug. 30.—Steamer Teuton wrecked off the Cape of Good Hope; 200 lives lost.

1883, July 3.—Steamer Daphne turned turtle in the Clyde; 124 lives lost.

1884, Jan. 18.—American steamer City of Columbus wrecked off Gay Head Light, Mass.; 99 lives lost.

1884, April 3.—Steamer Daniel Steinman wrecked off Sambro Head, N. S.; 131 lives lost.

1884, April 19.—Bark Ponema and steamship State of Florida sank in midocean after collision; 145 lives lost.

1884, July 23.—Spanish steamer Gijon and British steamer Lux in collision off Finistere; 150 lives lost.

1886, March 14.—Steamship Oregon, Cunard Line, run into by unknown steamer, eighteen miles east of Long Island, sank eight hours afterward; no lives lost.

1887, Jan. 29.—Steamer Kapunda in collision with bark Ada Melore off coast of Brazil; 300 lives lost.

1887, Nov. 15.—British steamer Wah Young caught fire between Canton and Hongkong; 400 lives lost.

1887, Nov. 19.—Steamer W. A. Scholten sunk by collision in the English Channel; 134 lives lost.

1888, Aug. 14.—Steamship Geiser sunk by collision with the Thingvalla; 105 lives lost.

1888, Sept. 13.—Italian steamship Sud America and steamship La France in collision near the Canary Islands; 89 lives lost.

1889, March 16.—United States warship Trenton, Vandalia, and Nipsic and German ships Adler and Eber wrecked on Samoan Islands; 147 lives lost.

1890, Jan. 2.—Steamer Persia wrecked off Corsica; 130 lives lost.

1890, Feb. 17.—British steamer Duburg wrecked in China sea; 400 lives lost.

1890, March 1.—British steamship Quetia foundered in Torres Straits; 124 lives lost.

1890, Sept. 19.—Turkish frigate Ertogrul foundered off Japan; 540 lives lost.

1890, Dec. 27.—British steamer Shanghai burned in China Sea; 101 lives lost.

1891, March 17.—Anchor liner Utopia in collision with British steamer Anson off Gibraltar and sunk; 574 lives lost.

1891, April 16.—British ship St. Catharis wrecked off Caroline Island; 90 lives lost.

1892, Jan. 13.—Steamer Namehow wrecked in China Sea; 414 lives lost.

1892, Oct. 28.—Anchor liner Romania wrecked off Corsica; 113 lives lost.

MARINE DISASTERS—Continued.

1893, Feb. 8.—Anchor Line Trinalria wrecked off Spain; 115 lives lost.

1893, Feb. 11.—Steamer Naronic, White Star Line, lost on the Atlantic and never heard from; 74 lives lost.

1893, June 22.—British battleship Victoria sunk in collision with the Camperdown off Syria; 357 lives lost.

1894, Nov. 1.—Steamer Wairaro wrecked off New Zealand; 134 lives lost.

1895, Jan. 30.—German steamer Elbe sunk in collision with British steamer Crathie in North Sea; 335 lives lost.

1895, March 11.—Spanish cruiser Reina Regenta foundered in Atlantic at entrance to Mediterranean; 400 lives lost.

1895, May 28.—French steamer Dom Pedro wrecked off coast of Galacia; about 100 lives lost.

1896, June 17.—Steamer Drummond Castle wrecked off Brest, France; about 250 lives lost.

1897, March 7.—Steamship Ville de St. Nazaire, French Line, burned in a storm off Cape Hatteras; 40 lives lost.

1898, July 2.—Steamship La Bourgoyne rammed British steel sailing vessel Cromartyshire and sank rapidly; 584 lives lost.

1904, June 15.—Gen. Slocum, excursion steamboat, with 1,400 persons aboard; took fire going through Hell Gate, East River; more than 1,000 lives lost.

1904, July 3.—Steamship Norge foundered at sea; 519 lives lost.

1905, Sept. 12.—Japanese warship Mikasa sunk after explosion in Sasebo Harbor; 599 lives lost.

1907, Feb. 12.—Steamship Larchmont in collision with Harry Hamilton in Long Island Sound; 183 lives lost.

1907, Feb. 21.—English mail steamship Berlin wrecked off the Hook of Holland; 142 lives lost.

1907, Feb. 24.—Austrian Lloyd steamship Imperatrix, from Trieste to Bombay, wrecked on Cape of Crete and sunk; 137 lives lost.

1907, January.—British steamship Pengwern foundered in the North Sea; crew and 24 men lost.

1907, January.—Prinz Waldemar, Hamburg-American Line, aground at Kingston, Jamaica after earthquake; 3 lives lost.

1907, February.—French warship Jean Bart sunk off coast of Morocco.

1907, March.—Steamship Congo sunk at mouth of Ems River by German steamship Nerissa; 7 lives lost.

1907, March.—French warship Jena blown up at Toulon; 120 lives lost.

1907, June.—Steamship Aden sunk off Socotra, on the east coast of Africa; 78 lives lost.

1907, July.—Steamship Columbia sunk off Shelton Cove, Cal., in collision with steamship San Pedro; 50 lives lost.

1908, Feb. 3.—Steamship St. Cuthbert, bound from Antwerp to New York, burned at sea off Nova Scotia; 15 lives lost.

1908, April 25.—British cruiser Gladiator rammed by American liner St. Paul off Isle of Wight; 30 lives lost.

1908, July.—Chinese warship Ying King foundered; 300 lives lost.

1908, Aug. 9.—Steamship Prudentia lost on voyage to Argentina.

1908, Aug. 23.—Norwegian steamship Folgefouden sunk; many lives lost.

1908, Nov. 5.—Steamship Archimedes lost in Baltic Sea; 10 drowned.

1908, Nov. 26.—Steamship Finance sunk by steamship Georgic off Sandy Hook; 4 lives lost.

1908, Nov. 6.—Steamship Taish sunk in storm off Etoro Island; 150 lives lost.

1908, Nov. 27.—Steamship San Pablo sunk off Philippine Islands; 100 lives lost.

1908, Dec. 13.—Steamship Ginsei Maru wrecked off Wei-Hai-Wai and crew and passengers drowned.

1908, Dec. 4.—Steamship Soo City foundered off Newfoundland; crew lost.

1909, Jan. 24.—Steamship Republic rammed off Nantucket by steamship Florida; 8 lives lost in collision; vessel sank; help received by wireless.

1911, Feb. 2.—Steamship Abenton wrecked 70 lives lost.

1911, April 23.—Steamship Asia ran aground; 40 lives lost.

1911, Sept 5.—Steamship Tuscapel wrecked 81 lives lost.

1911, Oct. 2.—Steamship Hatfield in collision and sunk; 20 lives lost.

1911, April 2.—Steamship Koombuna wrecked; 150 lives lost.

1912, Jan. 18.—Wistow Hall, British steamer, foundered off coast of Aberdeenshire, Scotland; 53 drowned.

1912, Feb. 13.—Ryoha Maru and Mori Maru, Japanese steamers, sunk in collision off Nagasaki; 46 lives lost.

1912, March 21.—Steamship Cachepol sunk after an explosion of her boilers, off the west coast of Peru; 70 lives lost.

1912, April 8.—Nile excursion steamer sunk in collision near Cairo, Egypt; 200 lives lost.

1912, April 15.—Steamship Titanic, White Star Line, struck an iceberg and sank; 1,517 lives lost.

1912, April 30.—Coasting boat Texas, Archipelago Steamship Company, sunk by a submarine mine at the entrance to Smyrna Bay; 69 lives lost.

1912, Sept. 23.—Russian steamer Obnevka sunk in Dvina River; 115 lives lost.

1913, Jan. 8.—Steamer Rosecrans sunk with 33 men on Pacific Coast.

1913, May 22.—French Messageries Maritimes liner Sénégal blown up by a mine in the Port of Smyrna; about 200 lives lost.

1913, May 26.—Steamship Nevada blown up by a mine in the Port of Smyrna; about 245 lives lost.

1913, Aug. 18.—State of California, steamer struck rock in Alaskan Sea and sank almost immediately; 32 perished.

Operations of the United States Life-Saving Service.

During the year ending June 30, 1912, a total of 1,730 vessels were reported by keepers of life-saving stations as having sustained casualties, more or less serious, within the field of service operations. Of these vessels, 455 were documented and 1,275 undocumented, the latter class comprising launches, sailboats, rowboats, etc.

Of the 455 documented vessels, 46 were lost; of the 3,731 persons on board, 6 were lost; 280 persons were succored at stations and 612 days' succor was afforded. The value of the vessels involved was $9,396,480; value of cargoes, $2,499,725; total value of property involved, $11,896,205; value of property saved, $9,860,995; value of property lost, $2,035,210.

Of the 1,275 undocumented vessels, 13 were totally lost; of the 3,462 persons on board, 10 perished, 164 persons were succored at stations and 202 days' succor was afforded. The value of the vessels involved was $1,314,420; value of cargoes, $37,680; total value of property involved, $1,352,100; value of property saved, $1,294,175; value of property lost, $57,925.

Of course these figures do not represent the entire amount saved by the service. A considerable portion was saved by salvage companies, wrecking tugs and other instrumentalities, often working in conjunction with the seamen. It is equally impossible to give an approximate estimate of the number of lives saved. Often a vessel with a long passenger list and a large cargo was saved only by the warning signals of the patrolman, while in many cases, either where vessels suffered actual loss or where they were warned of danger, no loss of life would have resulted, even though no aid had been rendered.

General Summary of Operations Since the Introduction of the Present Life-Saving System, 1871-1912.

Since the introduction of the present life-saving system, the disasters at sea have totaled 24,441, and the number of persons involved 159,332, this number including persons rescued not connected with vessels involved in disaster. The number of lives lost was 1,330. Eighty-five of these were lost at the disaster to the steamer "Metropolis" in 1877-78, when service was impeded by distance, and fourteen others in the same year owing to similar causes. The number of persons succored at stations, inclusive of those not connected with vessels involved in disaster, was 24,201, and the days' succor afforded was 54,516.

The total value of the vessels involved in disaster was $231,360,845, of which amount $86,909,229 represented the value of cargoes involved. $256,228,037 was saved and $62,042,037 was lost.

United States Steamboat Inspection Service.

This service is now under the jurisdiction of the Department of Commerce and Labor. The Supervising-Inspector General reported that for the fiscal year ending June 30, 1912, the number of annual certificates of inspection issued to domestic steam, motor, sailing vessels and barges, was 7,398; number of certificates issued to foreign passenger steam vessels 438, making a total of 7,836. The number of new life preservers inspected was 244,565, of which number 2,750 were rejected. 3,786 marine boiler plates were tested at the mills by assistant inspectors. There were 7,616 applicants for original and renewal of licenses examined for color-blindness, 206 of whom were found color blind and rejected. During the year there were 3 accidents caused by fire, resulting in the loss of 4 lives; 17 collisions in which 31 lives were lost; 8 explosions or accidental escape of steam, resulting in the loss of 14 lives; 32 killed as a cause of 11 accidents from striking snags, wrecks and sinking; 139 cases of accidental drowning and 44 deaths by miscellaneous accidents. During the fiscal year 307,692,494 passengers were carried on steam vessels that are required by law to report the number of passengers carried. Taking the total number of lives lost as 264, it is seen that 1,165,501 passengers were carried for each life lost, whether of passengers or crew, and from all causes.

United States Revenue Cutter Service.

The United States Revenue Cutter Service, organized in 1790, is a military arm of the Government attached to and under the direction of the Treasury Department. It is charged with the enforcement of the navigation and customs laws of the United States, the assistance of vessels in distress, the protection of the sealing industry in Alaska, the enforcement of quarantine laws, the destruction of derelicts and other dangers to navigation and numerous other duties. There are in the service 228 commissioned officers and cadets and 1,500 petty officers and enlisted men. 43 vessels, including 2 tug-boats and 6 launches, are used in the service.

Coal Consumption of Ocean Steamers.

The amount of coal consumed by a steamship increases much faster than the rate of increase of speed. This is shown in the following table, which applies to a "typical vessel" of 10,000 gross tons.

Knots.	Tons of Coal Consumed per Day.	Number of Firemen Required.	Mileage per Year.
10	44	15	42,000
11	53	18	46,200
12	65	22	50,400
13	79	26	54,600
14	96	32	58,800
15	117	39	63,000
16	144	48	67,200
17	173	58	71,400
18	209	70	75,600
19	254	85	79,800
20	305	102	84,000
21	371	127	88,200

AROUND THE WORLD IN THIRTY-SIX DAYS.

When Jules Verne wrote his fascinating story, "Around the World in 80 Days," he probably did not realize that within a comparatively short period this trip could be made in much abbreviated time. In fact Phineas Fogg could now make the complete circuit of the earth in slightly less than thirty-six days.

Numerous attempts have been made to beat the fictional record of Phineas Fogg by both men and women. The first of these journeys around the world against time was made in 1889 by Nellie Bly in 72 days 6 hours 11 minutes and 14 seconds. Geo. Francis Train made the trip in 1890 in 67 days 12 hours and 3 minutes. In 1901 Charles Fitzmorris made the trip in 60 days 13 hours 29 minutes and 42 2-5 seconds, in the race of schoolboys conducted by the Hearst papers.

Fitzmorris left	Chicago	May 20, 1901
	New York	May 22, 1901
	Berlin	May 30, 1901
	Moscow	June 1, 1901
	Irkutsk	June 10, 1901
	Stretensk, Siberia	June 13, 1901
	Blagoveschensk	June 21, 1901
	Vladivostok	June 27, 1901
	Yokohama	July 5, 1901
	Victoria, B. C.	July 16, 1901
Arrived in	Chicago	July 20, 1901

The first record breaker to use the Trans-Siberian Railway was Henry Frederick, who in 1903 made the circuit in 54 days 7 hours 20 minutes. In 1907 Col. Burnley Campbell reduced the time to 40 days 19 hours 30 minutes. In 1911 Andrew Jaeger-Schmidt made a record-breaking trip, the elapsed time being 39 days 19 hours 42 minutes 37 4-5 seconds.

July 17, 1911, 1:15 P.M., left Paris,
July 20, Moscow,
July 22, Omsk,
July 25, Irkutsk,
July 28, Harbin
July 29, Vladivostok,
July 31, Yokohama,
Aug. 12, Vancouver,
Aug. 18, Montreal,
Aug. 19, New York
Aug. 26, Paris.

This trip cost $1,426. Of this amount only $596 was spent for railroad fare and transportation, while $600 went in tips and gratuities.

The record of Jaeger-Schmidt was broken in 1913 by John Henry Mears by 3 days 22 hours and 37 seconds. Mears made the world trip of 21,066 miles in 35 days 21 hours 35 minutes and 4-5 seconds, thus traveling at an average speed of 587 miles a day or 24½ miles an hour. Jaeger-Schmidt had traveled 19,300 miles at an average daily rate of 480 miles, or 20 miles an hour.

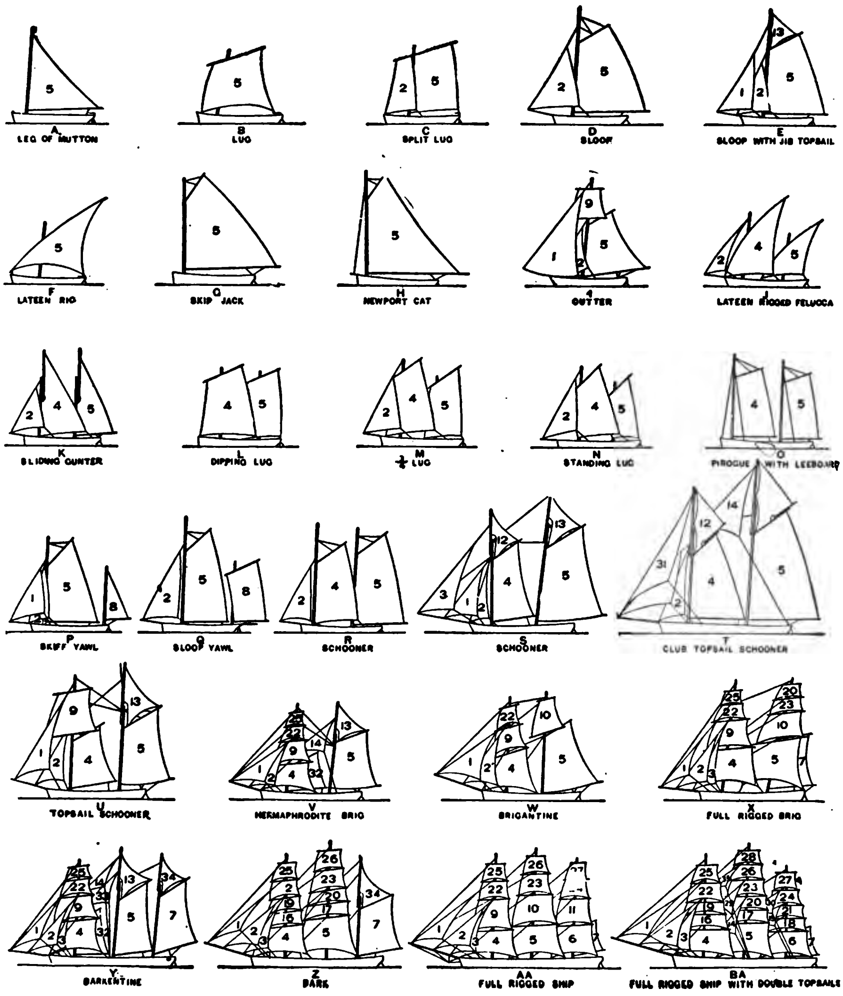
Mears left	New York	July 2, at 12.45 a.m.
	Berlin	July 9
	St. Petersburg	July 12
	Harbin	July 21
	Yokohama	July 24
	Victoria	Aug. 2
	St. Paul	Aug. 5
	Chicago	Aug. 5
Arrived in	New York	Aug. 6, at 10.20 p.m.

During the entire trip Mr. Mears slept in a hotel but once, and that was for two hours in London. The trip cost less than $800; this includes the liberal tips he distributed along the way and the money he spent in bribing the engine crew on the Trans-Siberian Railway.

An interesting feature of the trip was the flight of fifteen miles in an hydroaeroplane over Puget Sound from a yacht to Seattle. Mr. Mears stated after his trip that in order to break his record it would probably be necessary to resort to the use of an aeroplane from Fishguard to London and from Dover to Moscow, then cutting off about two days. It is expected that the new record will stand for years.

The record around the globe by the westward route is claimed by Daniel D. Bidwell, who in 1911 made the complete circuit in 47 days and 22 hours. The route taken by Mr. Bidwell took in Montreal, Vancouver, Yokohoma, Vladivostok, Moscow, Dover, and back to New York.

On July 23, 1911, a bicyclist named Pankratow started on a trip around the world on a bicycle from Harbin, Manchuria. He finished on Aug. 10, 1913, having ridden around the world on his wheel in two years and eighteen days.



RIGS OF SAILING VESSELS.

While there are not quite so many different rigs of sailing vessels as there are vessels, there are a great many, some of them differing but slightly from others, and there is much confusion of nomenclature, even among those who should know better than to get the rigs mixed in their minds. To aid in dispelling misunderstandings as to the names of the rigs of vessels, or as to how certain named rigs are to be understood, the accompanying illustrations have been prepared, showing a wide range from the smallest and the most simple sailing vessels to the largest and most complicated.

In the first place we may make a distinction by reason of the number of masts, which ranges from one to five. The second distinction may be in the manner in which the sails are attached, extended, and maneuvered; some being on horizontal yards swinging

crosswise of the mast, some on yards which lie obliquely to the horizontal, others having booms or gaffs attached at only one end to the mast, and others again having no sprit or spar by which to aid in their extension. Some sails are triangular, others have four well defined sides. Some vessels have all the sails centered at the masts, or are square rigged; in others all the sails are "fore and aft;" and others again have the sails on one or more masts of different type from those on the other or others; while in some, part of the sails on a mast are of one type and the rest of one or more others.

Referring to the illustrations, and considering only the number of masts: A to I inclusive have but one; J to X inclusive, two; and the rest have three. There are vessels having four and even five masts, but these do not require illustration as the sails on the other mast or masts are of the same general type as those on the three.

Of sails we have as distinct types No 5 A, which is a leg of mutton, having a boom to extend its lower edge; 5 B, which is a square sail, having its upper edge extended by a yard and found also at 4 and 5 L, M and N, 4 V, W, X, Y, Z, AA and BA; 5 X, Z, AA and BA, and 6 AA and BA. All these square sails have no yard to extend them on their lower edges.

In vessels F and J there will be seen to be one long yard at an angle to the mast and having its lower end made fast to a convenient point below. This is called a lateen rig.

In vessels D, E, G, H, I, O, P, Q, R, S, T, U, V, W, Y, all sails marked 5 are bent to the mast at their inner edge, and extended by a boom below and a gaff above. These are fore and aft sails. Other fore and aft sails, bent to stays and not to any mast, boom or yard, are the stay sails seen in vessels D, E, I, J, K, M, N, and on all the others from P on, inclusive. The particular sail on vessel A is a leg of mutton sail; on B, a lug sail or lug; on C, a split lug, differing from that on B by one portion being bent to the mast as well as to the yard above. In vessel K may be seen a "sliding gunter," the upper portion of which is extended by a spar which is hoisted alongside of the mast, constituting, practically, a sliding topmast; the sail being bent to both halves of the mast proper. On vessel L there is a dipping lug, and on M a three-quarter lug.

In S we see a schooner the topsails of which, marked 12 and 13, are extended by the topmast and the gaff; these being called gaff-topsails; while in T they have at their lower edges comparatively short spars called clubs, by which they may be more flatly strained than where the attachment is made directly to the corner (or clew) of the sail. In BB we see the topsails double; that is, instead of there being only one sail to the topmast, as in AD, 9, 10, 11, they are double, the upper half being bent to the regular yard above, and the other to a yard which is hoisted on the mast; the object being to enable the sail area to be more readily reduced than by reefing one large sail.

Taking the different rigs in order as lettered, A, is a leg of mutton, B a lug, C a split lug, D a sloop (having a single mast and only fore and aft sails), E a sloop having a gaff topsail, F a lateen rig, G a skipjack (having no bowsprit and no staysail nor topsail), H a catboat (which differs from the skipjack only in the hull), I the cutter as known in the United States Navy (distinguished by being sloop rigged, with a square topsail instead of a gaff topsail or a club topsail), J a lateen rigged felucca, K a sliding gunter (having practically a sliding topmast to which as well as to the mast the sail is bent), L a dipping lug, M a three-quarter lug, N a standing lug (one lower corner of the sail being secured to the mast, and the lower edge being extended without a boom), O a pirogue (having no bowsprit, no staysails, and no topsails, and being fitted with a lee board as shown), P a sloop yawl (having a small mast stepped astern and bearing a leg of mutton sail), Q a sloop yawl with a jigger.

R is a schooner having two masts, both fore and aft rigged; this one having no topsails and only one staysail; S a schooner with gaff topsails (sometimes called a gaff topsail schooner), T a schooner with club topsails (sometimes called a club topsail schooner), U a topsail schooner (having a square topsail on the foremast and a gaff topsail on the mainmast), V a hermaphrodite or modified brig (two masted and having the foremast square rigged and the mainmast fore and aft rigged), W a brigantine (having two masts, the foremast being square rigged and the mainmast having square topsails and but a mainsail extended by gaff and boom), X a brig (a two masted vessel square rigged on both masts), Y a barkentine (having three masts, the foremast being square rigged and the other two fore and aft rigged), Z a bark (having three masts, the foremast and mainmast being square rigged and the mizzenmast fore and aft rigged), AA a full rigged ship (having three masts, all square rigged), and BA a full rigged merchant ship (having double topsails as before explained).

The sails as illustrated on all the vessels shown bear the same numbers for the same name throughout. In all, 1 is the flying jib, 2 the jib, 3 the foretopmast staysail, 4 the foresail, 5 the mainsail, 6 the cross jack sail, 7 the spanker, 8 the jigger, 9 the fore topsail, 10 the main topsail, 11 the mizzen topsail, 12 the fore gaff topsail, 13 the main gaff topsail, 14, the main topmast staysail, 15 the mizzen topmast staysail, 16 the lower fore topsail, 17 the lower main topsail, 18 the lower mizzen topsail, 19 the upper fore topsail, 20 the upper main topsail, 21 the upper mizzen topsail, 22 the fore topgallant sail, 23 the main topgallant sail, 24 the mizzen topgallant sail, 25 the fore royal, 26 the main royal, 27 the mizzen royal, 28 the main skysail, 29 the main topgallant staysail, 30 the mizzen topgallant staysail, 31 the jib topsail, 32 the fore trysail, 33 the staysail, 34 the gaff topsail, 35 the main royal staysail.

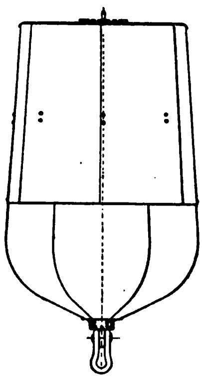
There are other kinds of sails not shown, as for instance studding sails, which are extended by yards on square rigged vessels, and other staysails than those shown may be set when the wind is light and they can be used to advantage to catch any wind.

There are other rigs which embody the features of those already shown, such for example as the three masted, four masted, and five masted schooners, the four masted and five masted ships and the four masted

shipentine, all of which are an extension of the rigs shown.

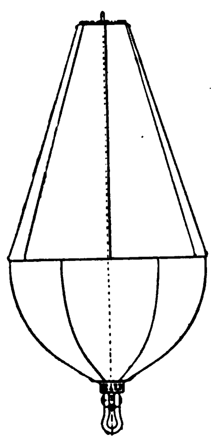
BUOYS.

In the United States it is customary to mark channels with red and black buoys. As the channel is entered from the sea the red buoys are on the starboard, or right side, and the black buoys on the port. Usually there is a difference in form between the two sets of buoys. The starboard or red buoys are of the type known as "nun" buoys,



CAN BUOY

sometimes called "nut" buoys, the part that projects out of the water being conical in form. The port or black buoys are of the type known as "can" buoys, the part that projects out of the water having the form of a

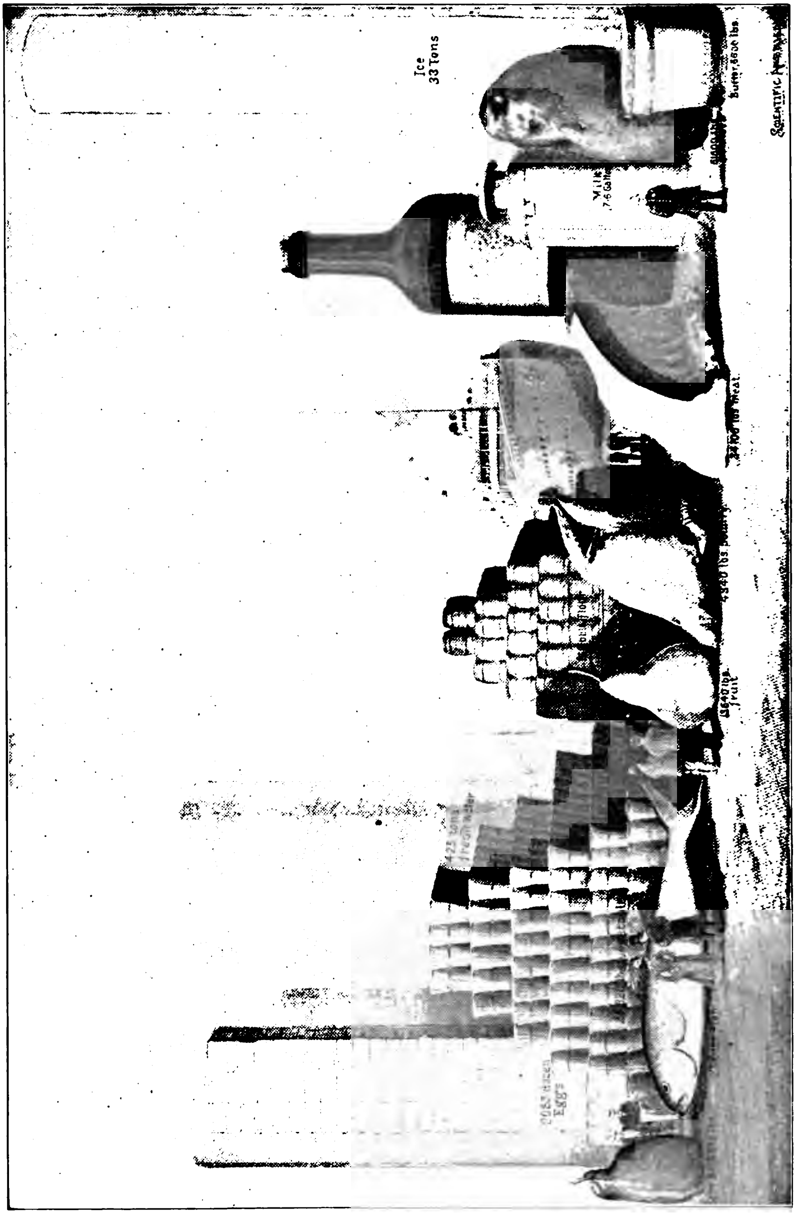


NUN BUOY

plain cylinder or else a sligntly tapered cylinder. In winter weather in waters where there is apt to be a great deal of ice, "spar" buoys are used instead of "can" and "nun" buoys, the "spar" buoys having the shape of a spar as the name implies. In Europe buoys are not as consistently used as in the United States and it is impossible for us to summarize here the significance of the different buoys in various European ports. At night certain channels are marked by "light" buoys; that is, buoys fitted with acetylene, Pintsch gas, or electric lights.

NAUTICAL TERMS

Abaft: Toward the stern or end of the vessel.
Aft: Toward the stern or end of the vessel.
Alleyway: The ship's passageway.
Altitude: This is the angular distance of the pole above the horizon.
Bower Anchor: This is an anchor which is ready for immediate use.
Bulkhead: A longitudinal or transverse partition.
Cart: A sea map.
Deadlight: This is a covering of wood or metal used in severe weather to protect glass portholes or windows.
Equinox: This is the equal length of the day and night occurring toward the end of March and September.
Ebb-Tide: Falling tide.
Forward: Toward the bow or front of the vessel.
Fore-and-aft: This refers to the length of the ship.
Fo'castle: This was formerly the seamen's quarters, but in the modern vessel they are quartered almost anywhere near their work.
Fathom: Six feet.
Flood-Tide: Rising tide.
Galley: This is the kitchen.
Height of tide: This is the difference between the level of high water and that of low water.
Larboard: The opposite of starboard; port is the later and more preferred term.
Lee-side: This is the side away from the wind.
Latitude: Distance directly North or South of the Equator.
Longitude: Distance directly East or West of the meridian of Greenwich.
Lights of vessels: These are the port and starboard lights, red and green, respectively, besides a white light in the foretop.
Mid-ship: This means the point which is equidistant between the bow and the stern.
Neap-tide: This is low tide caused by the sun and moon being farthest apart.
Port: This is the left-hand side of the ship looking toward the bow.
Porthole: A stateroom window secured in a massive metal ring adapted to be closed tightly.
Starboard: This is the right-hand side of the ship looking toward the bow.
Scuppers: Channels for water, usually at the outer edge of the deck.
Soundings: Depth of water in fathoms.
Spring-tide: This is high tide caused by the sun and moon being on the meridian together
Sheet-anchor: This is a spare anchor which is reserved for emergencies.
Thwartship: Crosswise to the ship.
Weather-side: This is the side of the ship toward the wind.



A GRAPHICAL COMPARISON OF THE PROVISIONS OF A TRANSATLANTIC LINER. (See next page.)

IT IS BETTER TO BE SAFE THAN SORRY.
Testing temperature of sea water.

PROVISIONING THE "KRONPRINZ WILHELM" FOR A SINGLE TRANSATLANTIC TRIP.

The Book of Genesis does not record the tonnage of the huge vessel which finally stranded on Mount Ararat, after finishing the most wonderful voyage ever described in the annals of mankind. But it is quite safe to assume that the dimensions of the Ark, that old-time floating storehouse, are exceeded in size by the largest of steamships now crossing the Atlantic.

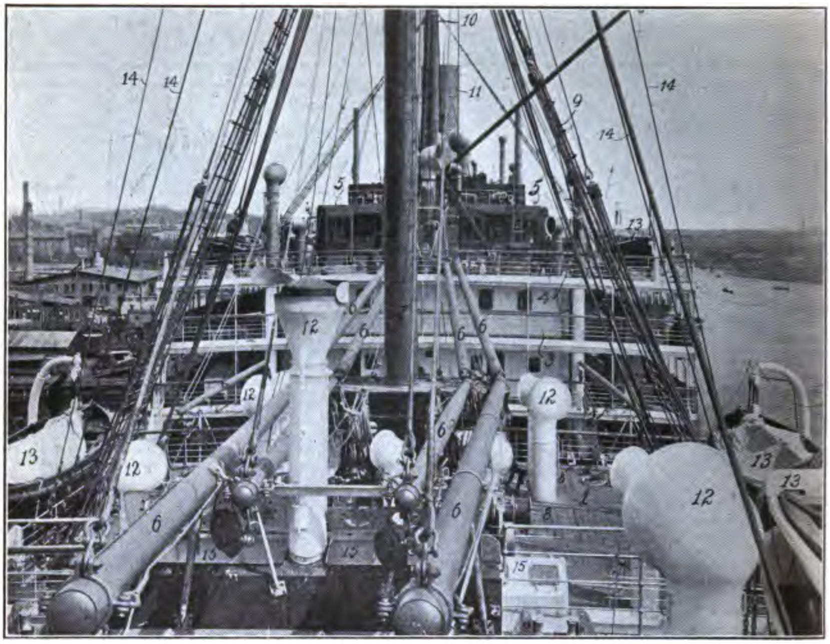
Not the least striking evidence of the size of these modern monsters of the deep is afforded by the vast quantities of food which must be taken aboard for a single six-day trip across the Atlantic. For the 1,500 passengers and the several hundred men constituting the crew, carloads of food and whole tanks of liquids are necessary. To enumerate in cold type the exact quantities of bread, meat, and vegetables consumed in a weekly trip would give but an inadequate idea of the storing capacity of a modern liner. We have, therefore, prepared a picture which graphically shows by comparison with the average man the equivalent of the meat, poultry, and breadstuffs, as well as the liquors used. Each kind of food has been concentrated into a giant unit, compared with which the figure of the average man seems puny.

On the "Kronprinz Wilhelm," of the North German Lloyd Line, which steamship we have taken for the purpose of instituting our comparisons, some 19,800 pounds of fresh meat and 14,300 pounds of salt beef and mutton, in all 34,100 pounds of meat, are eaten during a single trip from New York to Bremen. This enormous quantity of meat has been pictured in the form of a single joint of beef, which, if it actually existed, would be somewhat less than 10 feet high, 10 feet long, and 5 feet wide. If placed on one end of a scale, it would require about 227 average men in the other end to tip the beam.

For a single voyage the "Kronprinz Wilhelm" uses 2,640 pounds of ham, 1,320 pounds of bacon, and 506 pounds of sausage—in all, 4,466 pounds. Since most of this is pork, it may well be pictured in the form of a ham. That single ham is equivalent in weight to 374 average hams. It is 7¼ feet high, 3 feet in diameter and 2 feet thick.

The poultry eaten by the passengers of the steamer during a trip to Bremen or New York weighs 4,840 pounds. Suppose that we show these 4,840 pounds of poultry in the form of a turkey, dressed and ready for the oven. The bird would be a giant 10 feet long, 8 feet broad, and 5 feet high.

Sauerkraut, beans, peas, rice, and fresh vegetables are consumed to the amount of 25,320 pounds. Packed for market, these preserved and fresh vegetables would be contained in 290 baskets of the usual form, which piled up make a formidable truncated pyramid.



THE COMPLICATED GEAR OF A LARGE VESSEL.
Photograph taken on the "George Washington."

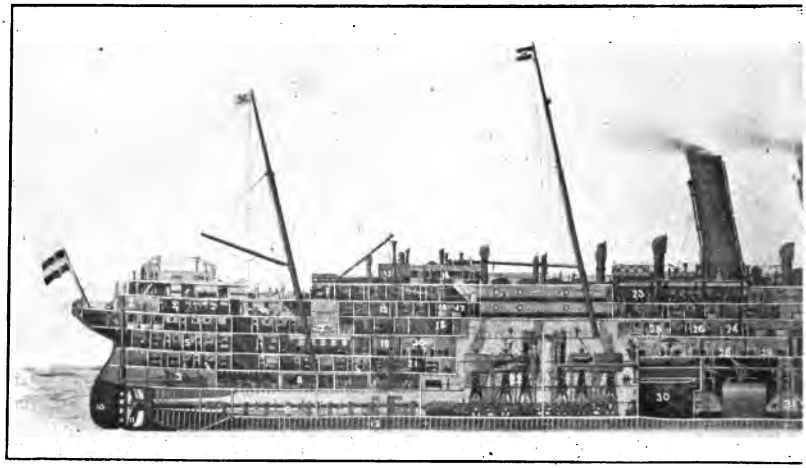
1 Main Deck.
2 Lower Promenade Deck.
3 Upper Promenade Deck.
4 Boat Deck.
5 Bridge Deck.
6 Cargo Beams.
7 Mast
8 Cargo Winches.
9 Rigging.
10 Derrick for Heavy Cargo
11 Smoke Funnel.
12 Ventilators.
13 Boats
14 Back Stays.
15 Skylights.

THE OLYMPIC ON HER MAIDEN VOYAGE.

AMIDSHIPS THERE IS MORE SPACE TO WALK ON THE SUN DECK.

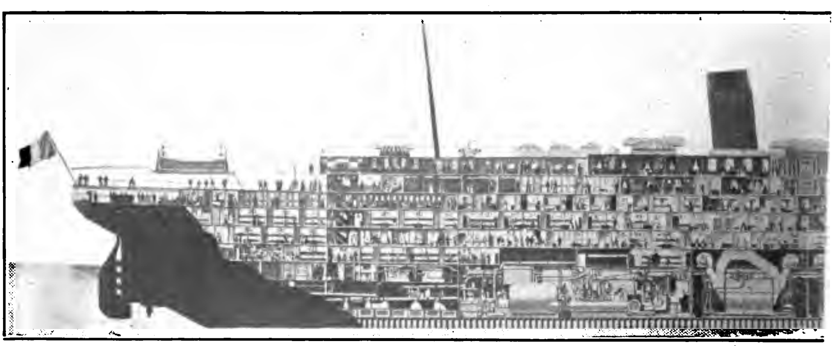
1 Smoke Stack.
2 Winter Garden.
3 Boat Deck.
4 Sun Deck.
5 Boats
6 Quadrant Davit.
7 Boat Tackle.
8 Ventilators.
9 Various Deck Houses.
10 Boat Winch.
11 Cargo Beams.
12 Awning Stanchions.

LIFEBOAT DRILL ON A TRANSATLANTIC LINER.
PROVISIONING THE BOATS.
Taken specially for this book.



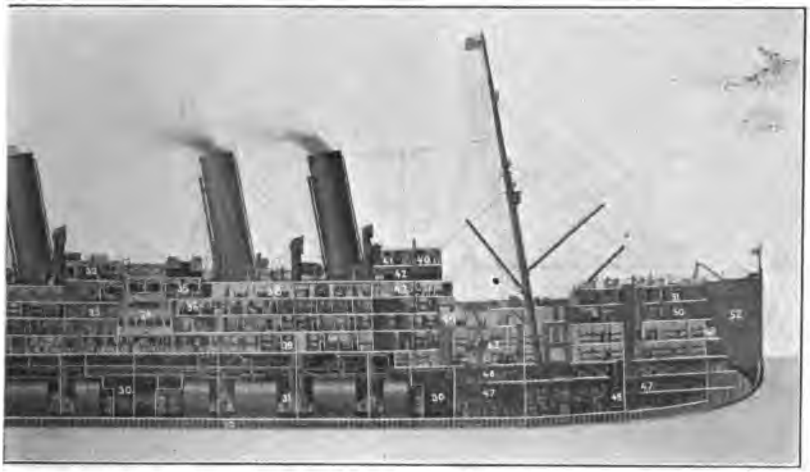
LONGITUDINAL SECTION OF THE TWIN SCREW-

1. Second Class Promenade Deck
2. Reserve rudder machine
3. Rudder machine
4. Second class Smoking room
5. Second class cabin
6. Second class Ladies' saloon
7. Second class Dining room
8. Baggage room
9. Shaft tunnel
10. Rudder
11. Screw
12. Double bottom
13. Vienna cafe Shelter
14. Vienna cafe (smokers)
15. First class cabin
16. Bathroom
17. Lavatory
18. Post office
19. Second class pantry
20. Second class kitchen
21. Firemen and trimmers
22. Engine room
23. First class Smoking room
24. First class cabins
25. Doctor's cabin
26. Barber's room



 TURBINES.

LONGITUDINAL SECTION OF THE TURBINE-DRIVEN



EXPRESS STEAMER "KAISER WILHELM II."

27. First class kitchen
28. First class pantry
29. Scullery
30. Coal bunkers
31. Boiler room
32. Vienna cafe (non-smokers)
33. Grand staircase
34. Dining room
35. Social Hall
36. Children's saloon
37. Chief Steward's office
38. Imperial suite
39. First class cabins
40. Navigating house
41. Chart house
42. Captain's rooms
43. Reading and Writing room
44. Steerage kitchen
45. Steerage
46. Provision department
47. Goods hold
48. Chains
49. Sails
50. Sailors
51. Anchor machine
52. Anchor

BOILERS.

STEAMER "FRANCE," A FINE TYPE OF LINER.

TABLE SHOWING THE DISTANCE OF THE HORIZON AT DIFFERENT ELEVATIONS.

Height	Distance to Horizon	Height.	Distance to Horizon	Height.	Distance to Horizon	Height.	Distance to Horizon	Height.	Distance to Horizon
Feet	Nautical Miles.	Feet	Nautical Miles.	Feet	Nautical Miles.	Feet	Nautical Miles.	Feet	Nautical Miles.
1	1.15	33	6.60	85	10.59	245	17.98	450	24.36
2	1.62	34	6.70	90	10.90	250	18.16	460	24.63
3	1.99	35	6.80	95	11.19	255	18.34	470	24.90
4	2.30	36	6.89	100	11.48	260	18.52	480	25.16
5	2.57	37	6.99	105	11.77	265	18.70	490	25.42
6	2.81	38	7.08	110	12.05	270	18.87	500	25.68
7	3.04	39	7.17	115	12.32	275	19.05	510	25.94
8	3.25	40	7.26	120	12.58	280	19.22	520	26.19
9	3.45	41	7.35	125	12.84	285	19.39	530	26.44
10	3.63	42	7.44	130	13.10	290	19.56	540	26.69
11	3.81	43	7.53	135	13.35	295	19.73	550	26.93
12	3.98	44	7.62	140	13.60	300	19.89	560	27.18
13	4.14	45	7.70	145	13.83	305	20.06	570	27.42
14	4.30	46	7.79	150	14.06	310	20.22	580	27.66
15	4.45	47	7.87	155	14.30	315	20.38	590	27.90
16	4.59	48	7.96	160	14.53	320	20.55	600	28.13
17	4.74	49	8.04	165	14.75	325	20.71	610	28.37
18	4.87	50	8.12	170	14.97	330	20.86	620	28.60
19	5.01	51	8.20	175	15.19	335	21.02	630	28.83
20	5.14	52	8.29	180	15.41	340	21.18	640	29.06
21	5.26	53	8.36	185	15.62	345	21.33	650	29.28
22	5.39	54	8.44	190	15.83	350	21.49	660	29.51
23	5.51	55	8.50	195	16.04	355	21 64	670	29.73
24	5.63	56	8.60	200	16.24	360	21.79	680	29.95
25	5.74	57	8.67	205	16.44	370	22.09	690	30.17
26	5.86	58	8.75	210	16.64	380	22.39	700	30.39
27	5.97	59	8.82	215	16.84	390	22.68	710	30.60
28	6.08	60	8.90	220	17.03	400	22.97	720	30.82
29	6.19	65	9.26	225	17.23	410	23.26	730	31.03
30	6.29	70	9.61	230	17.42	420	23.54	740	31.24
31	6.40	75	9 95	235	17.61	430	23.82	750	31.45
32	6.50	80	10.27	240	17.79	440	24.09	760	31.66

By this Table also the distance can be ascertained at which an object can be seen according to its elevation and the elevation of the eye of the observer.

EXAMPLE.—A tower 200 feet high will be visible at 20¾ miles to an observer whose eye is elevated 15 feet above the water. Thus:—

$$\left.\begin{array}{llll} 15 \text{ feet elevation, distance visible} & 4.45 & \text{nautical miles} \\ 200 \quad \text{"} \qquad \text{"} \qquad \text{"} & 16.24 & \text{"} \quad \text{"} \end{array}\right\} = 20.69 \text{ nautical miles.}$$

ENGINE ROOM, OIL MOTOR-DRIVEN "SELANDIA."

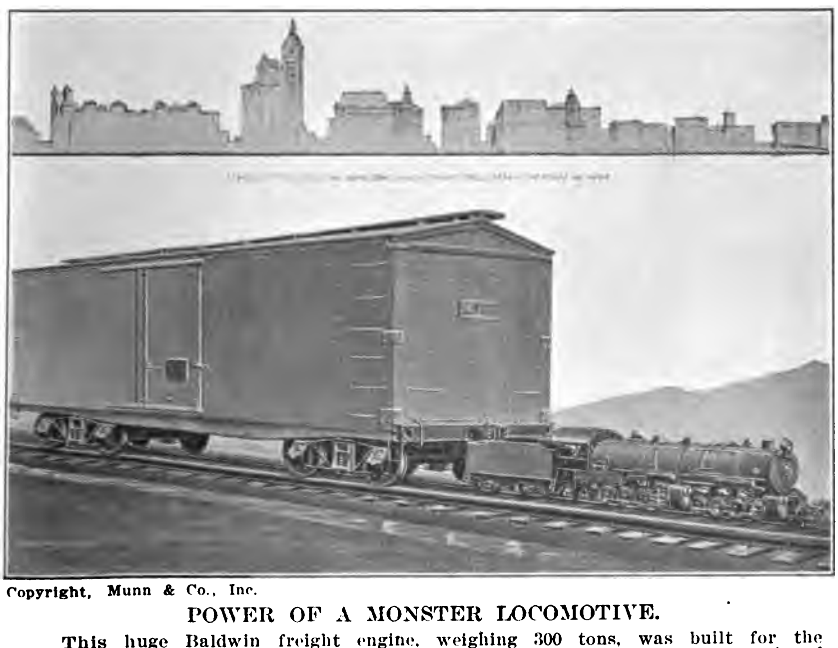
CHAPTER VII.

RAILROADS.

For invaluable information relative to Railroads, both for the United States and foreign countries, the Editor is indebted to Mr. Slason Thompson, Director of the Bureau of Railway News and Statistics, Chicago. A considerable number of the tables are printed through his courtesy, and a painstaking revision of this chapter is also due to him.

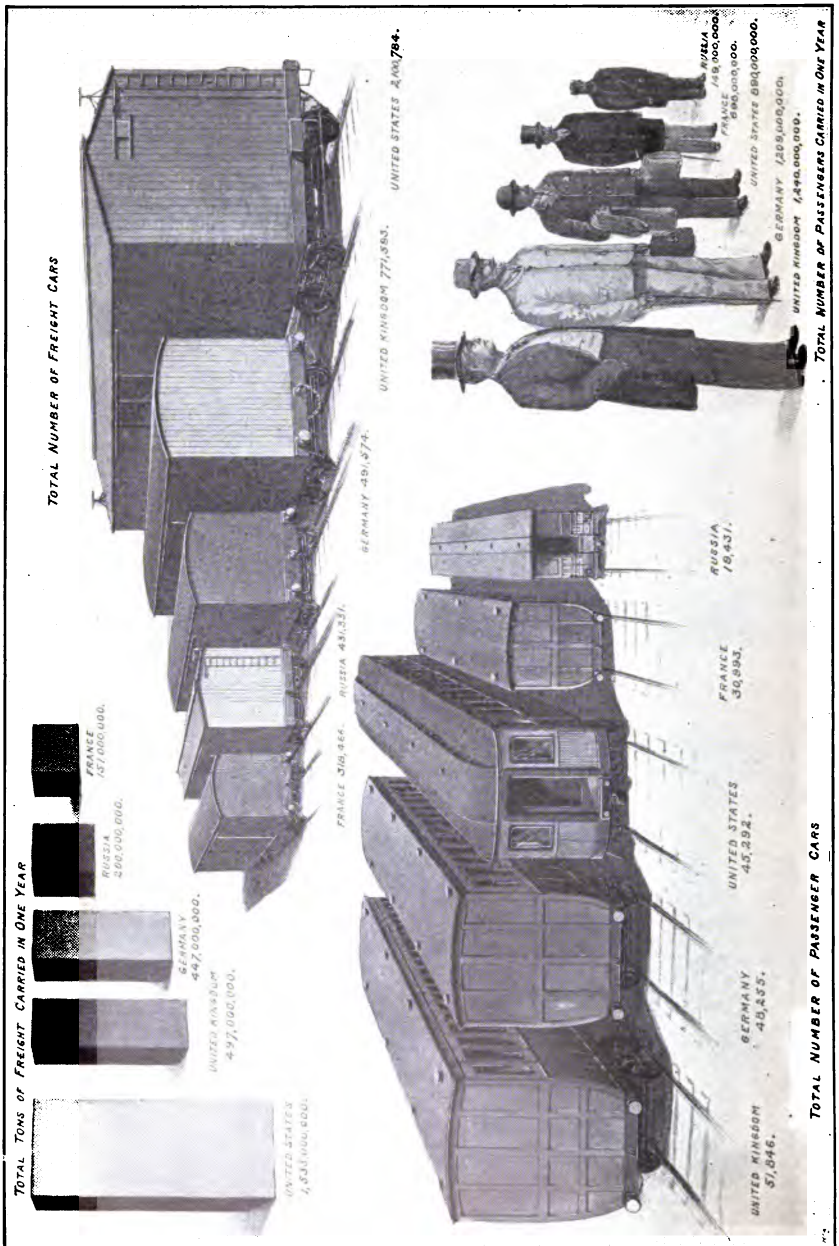
In single-track mileage the Bureau figures 95% of the total mileage operating in the United States; in traffic figures they cover 97.5%.

The passenger mileage is obtained by multiplying the number of passengers carried by the average journey in miles. In the case of the United Kingdom that is an approximation of 7.8 miles, from the formula of the London Statist. Same is true of the average haul of 25 miles for freight in the United Kingdom. In this case it is corroborated by the individual figures of the Northeastern Railway of England, which is the only British road giving that information. The ton mileage can be obtained by multiplying the freight tons carried by the average haul in miles.



POWER OF A MONSTER LOCOMOTIVE.

This huge Baldwin freight engine, weighing 300 tons, was built for the Southern Pacific Railroad. It is capable of hauling 10 miles an hour a train of 169 cars weighing, with load, 72 tons each. The train, weighing 10,000 tons, would reach for over a mile, or, say, from City Hall Square to the Battery, New York. The lower cut represents the size of a single car, 200 feet by 45½ feet by 62 feet, that would be necessary to contain the load of wheat handled.



GRAPHICAL COMPARISON OF THE ROLLING STOCK AND FREIGHT AND PASSENGER TRAFFIC OF THE WORLD'S LEADING RAILROADS.

GROWTH OF RAILWAYS OF THE WORLD.

In the following table is given the mileage of the principal countries in the world from the earliest date available to the latest:

Country	Miles of Road Completed									
	Opened	1840	1850	1860	1870	1880	1889	1899	1910†	1912‡
Great Britain...	1825	1,857	6,621	10,433	15,537	17,933	19,943	21,666	23,280	23,417
United States..	1827	2,818	9,021	30,626	52,922	93,296	160,544	....	236,422	248,888
Canada........	1836	16	66	2,065	2,617	7,194	12,585	17,250	24,731	26,727
France.........	1828	....	1,714	5,700	11,142	16,275	21,899	26,229	29,364	30,119
Germany.......	1835	341	3,637	6,979	11,729	20,693	24,845	31,386	36,235	37,255
Belgium........	1835	207	554	1,074	1,799	2,399	2,776	2,883	2,888	5,132
Austria (proper)	1837	....	817	1,813	3,790	7,083	9,345	11,921	13,591	14,038
Russia in Europe.......	1838	....	310	988	7,098	14,026	17,534	26,889	35,347	41,888
Italy...........	1839	13	265	1,117	3,825	5,340	7,830	9,770	10,425	10,425
Holland........	1839	10	110	208	874	1,143	1,632	1,966	2,235	2,439
Switzerland....	1844	....	15	653	885	1,596	1,869	2,342	2,791	3,034
Hungary.......	1846	....	137	1,004	2,157	4,421	6,751	10,619	12,177	12,821
Denmark......	1847	....	20	69	470	975	1,217	1,764	2,121	2,121
Spain..........	1848	....	17	1,190	3,400	4,550	5,951	8,252	8,961	9,272
Chili...........	1851	....	....	120	452	1,100	1,801	2,791	3,451	3,451
Brazil..........	1851	....	....	134	504	2,174	5,546	9,195	11,863	12,968
Norway........	1854	....	....	42	692	970	970	1,231	1,608	1,845
Sweden........	1856	....	....	375	1,089	3,654	4,899	6,663	8,321	8,554
Argentine Republic........	1857	....	....	....	637	1,536	4,506	10,013	14,111	18,166
Turkey in Europe.......	....	....	....	41	392	727	1,024	1,900	1,967	2,100
Peru...........	....	....	....	47	247	1,179	993	1,035	1,470	1,470
Portugal.......	....	....	....	42	444	710	1,118	1,475	1,689	1,689
Greece.........	1869	....	....	....	6	7	416	604	845	979
Uruguay.......	1869	....	....	....	61	268	399	997	1,371	1,443
Mexico.........	1868	....	....	....	215	655	5,012	8,503	14,845	14,990
Roumania......	....	....	....	....	152	859	1,537	1,920	1,976	2,153
Australia*......	....	....	....	....	....	789	4,850	11,111	17,956	18,195
Japan..........	1874	....	....	....	....	75	542	3,632	5,130	5,130
British India...	1853	....	....	838	4,771	9,162	15,887	23,523	30,809	32,099
China..........	1883	....	....	....	....	....	124	401	4,997	5,274
Africa..........	....	....	....	....	....	583	2,873	5,353	19,207	20,758

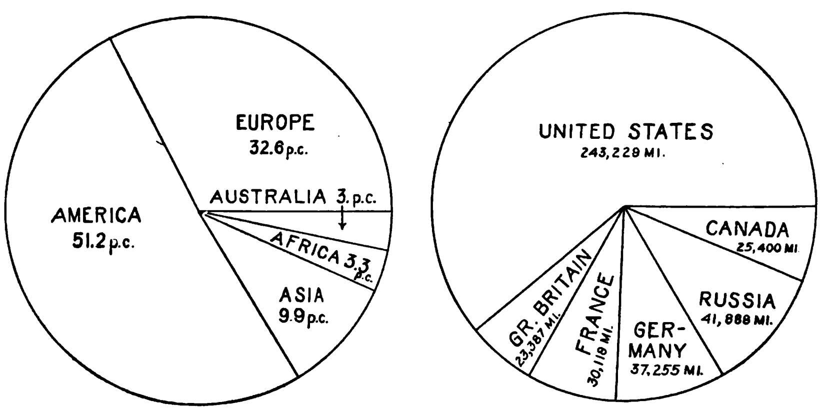
*Including New Zealand.
†Or latest figures.
‡Includes Asiatic Railways.

The proportion of state to privately owned railways as given by Mr. Edwin A. Pratt in "Railways and Nationalization," 1908, was:

Company Owned Railways..	389,000
State Owned Railways..	161,000
Total..	550,000

STATISTICS OF

Country	Year	Miles Covered by Capitalization	Capitalization or Cost of Construction (c)	Passenger Revenue	Freight Revenue	Other Revenues
United Kingdom...	1911	23,417	$6,447,969,398	$215,168,940	$308,197,950	$96,197,110
German Empire....	1910	36,740	4,163,615,519	198,737,378	452,969,934	69,765,822
France............	1909	25,017	3,593,660,000	152,566,693	184,394,516	5,284,147
Russian Empire....	1908	41,888	3,378,839,810	80,787,020	306,014,545	39,811,560
Austria............	1910	14,038	1,654,207,119	48,520,000	135,360,000	12,500,000
Hungary...........	1910	12,821	858,732,000	25,009,200	65,460,200	4,265,800
Italy (a)...........	1910–11	8,908	1,131,300,000	36,060,084	60,247,652	5,264,847
Spain (a)...........	1905	8,810	649,919,610	16,215,866	34,694,555	6,190,271
Portugal...........	1908	1,465	162,385,280	4,039,350	5,715,150	351,750
Sweden............	1909	8,366	277,952,716	12,226,160	20,762,228	992,672
Norway............	1911	1,891	81,467,176	2,667,672	3,437,904	359,656
Denmark (a)......	1911	1,215	70,277,640	5,429,948	5,942,900	796,496
Belgium (a)........	1910	2,685	504,210,184	19,750,243	38,275,374	1,672,178
Holland (a)........	1910	1,978	d 163,798,304	12,374,800	12,094,800	1,272,400
Switzerland........	1910	2,924	341,208,367	18,542,282	22,577,912	1,809,944
Roumania..........	1911	2,153	186,670,372	....	....	....
Total Europe.......		194,316	$23,666,213,495	$848,095,636	$1,656,145,620	$246,534,653
Canada............	1912	26,727	1,585,724,797	56,543,664	148,030,269	14,829,819
Argentina	1910	17,381	868,914,950	....	....	....
Japan (a)...........	1911	4,764	411,598,253	21,072,498	20,428,230	2,646,015
British India.......	1910	32,099	f1,448,700,000	63,261,000	100,419,000	5,049,000
New South Wales...	1912	3,831	260,613,180	11,439,630	18,092,050	2,079,490
New Zealand.......	1911	2,761	153,448,830	5,521,470	9,805,390	2,144,045
United States......	1912	248,888	14,657,545,000	668,642,865	1,980,805,606	221,288,226



COMPARISON OF WORLD'S RAILWAYS BY CONTINENTS AND PRINCIPAL COUNTRIES, 1909.

FOREIGN RAILWAYS.

Total Revenues	Operating Expenses	Rates Expenses to Revenues	Passengers Carried	Average Journey (Miles)	Freight Tons Carried	Average Haul (Miles)	Per Cent Net Revenue to Capital
$619,564,000	$380,689,660	61.8	1,793,820,800	b 7.8	523,653,094	b 25.0	3.67
722,473,134	490,999,236	67.9	1,540,872,110	14.2	531,527,817	60.4	5.74
342,245,356	200,834,642	58.6	491,936,930	20.5	165,027,920	80.2	3.94
426,613,125	344,497,405	80.8	162,117,000	79.0	229,554,000	160.1	2.43
196,380,000	150,860,000	76.9	254,618,531	18.3	137,599,886	68.2	2.75
94,735,200	61,362,800	64.7	140,002,000	19.5	68,806,000	72.9	3.87
101,572,383	81,486,337	80.3	....	b 25.0	....	b 66.0	1.77
57,100,692	27,750,936	48.6	41,846,249	b 26.0	22,662,548	69.4	4.50
10,106,250	4,672,500	46.2	14,585,698	b 20.0	4,315,385	b 54.0	3.35
33,981,060	26,836,984	79.0	53,787,226	16.6	31,133,715	43.4	2.57
6,465,232	4,803,096	74.2	13,795,396	16.1	5,196,241	38.6	2.22
12,169,344	11,257,072	92.5	22,344,630	21.8	4,934,799	53.1	1.33
59,697,795	39,123,036	65.5	173,491,334	15.4	58,793,837	49.7	3.80
25,742,000	21,365,860	83.0	47,711,000	17.9	16,702,400	51.9	2.67
42,930,138	27,230,010	63.2	110,068,465	13.0	16,466,758	45.5	4.60
18,756,585	11,660,674	62.1	10,233,000	43.7	8,823,551	b 96.5	3.80
$2,770,532,294	$1,885,610,248	68.0	$4,871,230,369	15.1	1,825,197,951	64.3	
219,403,752	150,726,539	68.7	41,124,181	70.8	89,444,331	218.7	4.27
107,058,065	63,616,485	59.4	59,014,600	24.2	33,606,626	120.9	3.85
44,147,123	21,624,686	48.9	138,629,706	21.9	25,481,868	83.5	5.47
168,729,000	89,595,000	53.1	371,580,000	36.1	65,600,000	184.3	5.46
31,611,170	20,303,030	64.2	70,706,728	15.4	10,631,751	81.0	4.35
17,470,905	11,516,860	64.8	11,200,613	b 23.0	5,863,674	80.0	4.02
2,870,736,697	e2,108,351,953	73.4	994,382,480	33.7	1,806,173,565	148.0	5.25

(a)State only. (b)Estimated. (c)From latest report, not always year named. (d)Estimated capital cost of Holland's railways not given since 1897. (e)Including taxes. (f)Valuing the Indian rupee at 33 cents (.324 1-2)

From 1908 to 1910 the rate per ton mile in the United Kingdom was 2.33 cents; in France, 1.36 cents; in Germany, 1.41; Russia, .95; Austria, 1.36; Sweden, 1.60; Norway, 1.77; Denmark, 2.00; Holland, 1.35; Belgium, 1.17; and in Switzerland, 2.86 cents. No recent ton mile statistics for Italy are available, though taking the average haul as under 70 miles, the average receipts per ton mile were probably in the neighborhood of 2.25 cents.

DISTANCES ACROSS NEW YORK CITY.

From Pier 1, North River, via Battery place and Whitehall street to East River, one-half mile; from foot of Dey street, North River, to foot of Fulton street, East River, three-quarters of a mile; from foot of Chambers street, North River, via Chambers, New Chambers and James slip to East River, one mile; from foot of Canal street, North River, to Broadway, three-quarters of a mile; from foot of Canal street, North River, to Bowery, one mile and an eighth; from foot of Canal street, North River, to foot of Grand street, East River, two and an eighth miles; from foot of West Houston street to foot of East Houston street, two and an eighth miles; from foot of West Fourteenth street to Broadway, one and an eighth miles; from foot of West Fourteenth street to foot of East Fourteenth street, two and three-eighths miles; from foot of West Twenty-third street to Sixth avenue, one mile; from West Twenty-third street to foot of East Twenty-third street, two and three-eighths miles. North of Twenty-third street the average width of the island of Manhattan is from two to two and a half miles.

SUMMARY OF THE WORLD'S RAILWAYS AND RATIO OF MILEAGE TO AREA AND POPULATION IN EACH COUNTRY IN 1910.

Countries	Mileage in 1910		Miles of Line per 100 Sq. Miles	Inhabitants per Mile of Line
	State Railways	Total Railways		
I. EUROPE				
Germany	34,625	37,996	17.9	1,724
Austria-Hungary (including Bosnia and Herzegovina)	22,047	27,571	10.6	1,852
Great Britain and Ireland	......	23,351	19.3	1,923
France	5,511	30,687	14.8	1,282
Russia in Europe (including Finland 2,246 miles)	21,659	37,008	1.8	3,449
Italy	8,830	10,538	9.5	3,334
Belgium	2,686	5,288	46.3	1,408
Luxemburg	119	318	31.7	795
Netherlands	1,663	1,984	15.6	2,941
Switzerland	1,701	2,921	18.3	1,220
Spain	......	9,317	4.8	2,000
Portugal	671	1,808	5.1	2,940
Denmark	1,217	2,192	14.8	1,176
Norway	1,557	1,921	1.6	1,220
Sweden	2,717	8,688	5.0	629
Servia	357	494	2.6	5,882
Roumania	1,980	2,238	4.3	3,030
Greece	......	981	3.9	2,703
Bulgaria	987	1,106	2.9	3,846
Turkey in Europe	......	968	1.4	6,250
Malta, Jersey, Isle of Man	......	68	16.1	5,263
Total for Europe, 1910	107,727	207,447	5.5	2,180
" " " 1909	....	204,864	5.5	1,923
" " " 1908	....	201,619	5.3	1,941
" " " 1907	....	199,345	5.3	1,887
" " " 1906	....	196,437	5.2	1,993
" " " 1905	....	192,507	5.1	2,084
" " " 1904	....	189,806	5.0	2,084
" " " 1903	....	186,685	5.0	2,084
" " " 1902	....	183,989	4.9	2,127
" " " 1901	....	180,817	4.8	2,174
" " " 1900	....	176,396	4.7	2,220
" " " 1899	....	172,953	4.6	2,220
" " " 1898	....	167,614	4.4	......
" " " 1897	....	163,550	4.3	......
" " " 1896	....	160,030	4.2	......
Increase in fourteen years	....	47,417	....	......

RELATION OF RAILWAYS TO AREA AND POPULATION (See page 241.)

Although this table is favored by railway statisticians in comparing railway conditions relatively to area and population, it is doubtful whether it conveys an adequate impression of the exceptionally favorable transportation facilities enjoyed by the inhabitants of this continent, and especialy those of the United States and Canada. For instance, the figures mean that the United States with 800,000 square miles less territory and not one-quarter the population, has 36,000 more miles of railway than all Europe, while Canada, having a territory in which the United Kingdom could be lost thirty times, and only one-sixth the population, has actually more railway mileage than the parent kingdom.

SUMMARY OF THE WORLD'S RAILWAYS AND RATIO OF MILEAGE TO AREA AND POPULATION IN EACH COUNTRY IN 1910—Continued.

Countries	Mileage in 1910		Miles of Line per 100 Sq. Miles	Inhabitants per Mile of Line
	State Railways	Total Railways		
II. AMERICA				
Canada	1,718	24,726	0.8	263
United States of America (inclusive of Alaska 420 miles)		241,203	6.8	369
Newfoundland		666	1.6	359
Mexico		15,260	1.9	952
Central America (Guatemala, 594 miles; Honduras, 90 miles; Salvador, 122 miles; Nicaragua, 200 miles; Costa Rica, 547 miles; Panama, 47 miles)		1,599		
Greater Antilles (Cuba, 2,331 miles; Dominica, 195 miles; Haiti, 139 miles; Jamaica, 185 miles; Porto Rico, 200 miles)	42	3,031		
Lesser Antilles (Martinique, 139 miles; Barbadoes, 108 miles; Trinity, 88 miles)		336		
United States of Colombia		510	0.1	9,091
Venezuela		633	0.16	3,846
British Guiana		103	0.11	2,859
Dutch Guiana		37		
Ecuador		333	0.32	4,166
Peru	844	1,584	0.32	2,940
Bolivia		756	0.16	3,030
United States of Brazil	5,443	13,278	0.5	1,613
Paraguay		157	0.16	4,000
Uruguay		1,546	2.3	671
Chili	1,682	3,526	1.0	943
Argentine Republic	2,467	17,794	1.6	275
Total for America	12,197	327,084		
III. ASIA				
Central Russia in Asia	6,181	4,066	1.9	2,325
Siberia and Manchuria		6,739	0.14	1,032
China		5,420	0.13	83,300
Japan (including Corea)	4,542	6,093	2.4	10,000
British India	24,460	32,092	1.6	9,091
Ceylon		577	2.3	7,143
Persia		34	0.005	280,000
Asia Minor, Syria, Arabia, including Cyprus	912	3,130	0.5	6,250
Portuguese Indies		51	3.5	11,110
Malay Archipelago		757	2.3	9,434
Dutch Indies		1,551	0.6	20,000
Siam	637	637	0.32	14,278
Cochin China		2,178		
Total for Asia	36,733	63,329		

SUMMARY OF THE WORLD'S RAILWAYS AND RATIO OF MILEAGE TO AREA AND POPULATION IN EACH COUNTRY IN 1910—Continued.

Countries	Mileage in 1910		Miles of Line per 100 Sq. Miles	Inhabitants per Mile of Line
	State Railways	Total Railways		
IV. AFRICA				
Egypt	2,792	3,674	1.0	3,125
Algiers and Tunis	....	3,134	1.0	2,128
Belgian Congo	....	515	....	....
South African Union, including Cape Colony, Natal, Cent. So. African and Rhodesian Railways	9,192	9,645	....	....
COLONIES				
German	1,691	1,691	....	....
English	....	1,807	....	....
French	....	1,360	....	....
Italian	....	72	....	....
Portuguese	....	1,001	....	....
Total for Africa	....	22,900	....	....
V. AUSTRALIA				
New Zealand	2,716	2,746	2.6	371
Victoria	3,490	3,505	4.0	362
New South Wales	3,642	3,783	1.3	422
South Australia	1,911	2,082	0.16	208
Queensland	3,661	4,011	0.6	226
Tasmania	469	633	2.4	293
West Australia	2,144	2,422	0.16	193
Hawaii, etc	....	88	1.3	1,234
Total for Australia	18,035	19,272	0.6	311
RECAPITULATION				
I. Europe	107,727	207,447	5.5	2,180
II. America	12,197	327,084	....	....
III. Asia	36,733	63,329	....	....
IV. Africa	13,674	22,900	....	....
V. Australia	18,035	19,272	0.6	311
Total	188,368	640,032	....	....

DISTANCES IN NEW YORK.

From the Battery. Miles.	TO	From the Battery. Miles.	TO	From the Battery. Miles.	TO	From the Battery. Miles.	TO
¼	Rector.	4½	East 54th.	8¾	East 139th.	13	East 199th.
½	Fulton.	4¾	East 58th.	9	East 144th.	13¼	S. Mosholu P'k-
¾	City Hall.	5	East 63d	9¼	East 149th.		w'y & Web. av.
1	Leonard.	5¼	East 68th.	9½	East 154th.	13½	East 205th.
1¼	Canal.	5½	East 73d.	9¾	East 159th.	13¾	East 208th.
1½	Spring.	5¾	East 78th.	10	East 164th.	14	W'msbridge sta.
1¾	E. Houston.	6	East 83d.	10¼	Spring pl.	14¼	Jerome ave., c.
2	East 4th.	6¼	East 88th.	10½	East 168th.		Woodlawn rd.
2¼	East 9th.	6½	East 93d.	10¾	East 170th.	14½	Jerome ave., c.
2½	East 14th.	6¾	East 97th.	11	East 172d.		Mt. Vernon av.
2¾	East 19th.	7	East 102d.	11¼	East 174th.	14¾	Jerome ave., c.
3	East 24th.	7¼	East 107th.	11½	Tremont ave.		East 133d.
3¼	East 29th.	7½	East 112th.	11¾	East 179th.	15	E. 237th, c. Mt.
3½	East 34th.	7¾	East 117th.	12	East 182d.		Vernon ave.
3¾	East 38th.	8	East 121st.	12¼	East 186th.	15¼	East 239th.
4	East 44th.	8¼	East 128th.	12½	Pelham ave.	15¾	City line.
4¼	East 49th.	8½	East 134th.	12¾	East 195th.		

SUMMARY OF RAILWAY MILEAGE IN THE UNITED STATES, BY STATES, FOR THE YEARS ENDING JUNE 30, 1912, 1911 AND 1910, AND ITS RELATION TO AREA AND POPULATION.

State	Bureau's Figures		Commission's Figures		Population Per Mile of Line 1910 #
	1912 Miles Operated	1911 Miles Operated	1910 Miles Owned	Miles of Line per 100 Sq. Miles	
Alabama	5,054	4,994	5,226	10.19	409
Arizona	1,974	1,962	2,097	1.84	97
Arkansas	4,376	4,253	5,306	10.10	296
California	6,739	6,610	7,772	4.99	306
Colorado	5,716	5,646	5,532	5.34	144
Connecticut	1,000	1,000	1,000	20.75	1,115
Delaware	339	340	337	17.04	604
Florida	3,923	3,769	4,431	8.08	169
Georgia	6,839	6,631	7,056	12.02	369
Idaho	2,151	1,925	2,178	2.61	149
Illinois	13,024	13,257	11,878	21.20	474
Indiana	7,629	7,098	7,420	20.59	364
Iowa	9,867	9,987	9,755	17.55	228
Kansas	9,312	9,216	9,007	11.01	184
Kentucky	3,587	3,494	3,526	8.77	649
Louisiana	4,695	4,477	5,554	12.23	298
Maine	2,113	2,096	2,248	7.52	330
Maryland	1,325	1,326	1,426	14.35	901
Massachusetts	2,138	2,087	2,115	26.31	1,592
Michigan	8,471	8,360	9,021	15.69	311
Minnesota	8,952	8,893	8,669	10.72	239
Mississippi	3,860	3,672	4,506	9.72	399
Missouri	8,287	8,336	8,083	11.76	407
Montana	4,332	4,294	4,207	2.88	89
Nebraska	6,224	6,151	6,067	7.90	196
Nevada	1,630	1,601	2,276	2.07	35
New Hampshire	1,237	1,213	1,245	13.80	345
New Jersey	2,260	2,146	2,260	30.08	1,122
New Mexico	3,048	2,975	3,032	2.48	108
New York	8,353	8,338	8,430	17.09	1,081
North Carolina	4,228	4,110	4,932	10.12	447
North Dakota	4,430	4,379	4,201	5.99	137
Ohio	9,261	9,028	9,134	22.42	521
Oklahoma	5,907	5,898	5,980	8.62	277
Oregon	2,131	2,125	2,284	2.39	294
Pennsylvania	10,986	10,894	11,290	25.18	678
Rhode Island	195	196	212	19.88	2,557
South Carolina	3,072	2,878	3,442	11.29	440
South Dakota	3,994	3,984	3,947	5.14	148
Tennessee	3,633	3,587	3,815	9.15	572
Texas	13,977	13,081	14,281	5.44	272
Utah	1,834	1,819	1,985	2.42	188
Vermont	962	936	1,100	12.06	323
Virginia	4,421	4,436	4,534	11.26	454
Washington	5,140	5,133	4,875	7.29	234
West Virginia	3,068	2,885	3,600	14.99	339
Wisconsin	7,351	7,106	7,475	13.53	312
Wyoming	1,477	1,457	1,645	1.69	89
Dist. of Columbia	51	52	36	59.95	9,174
Canada†	1,871	1,760	.....	.....	.....
Mexico†	....	226	.....	.....	.....
United States	236,444	232,117	240,438	8.08	382

Census figures 1910 divided by commission's figures for 1910.

† Mileage operated in Canada and Mexico by American roads.

SUMMARY OF MILEAGE OF SINGLE TRACK, SECOND, THIRD AND FOURTH TRACK AND YARD TRACK AND SIDINGS IN THE UNITED STATES, 1890 TO 1912.

Year	Single Track	Second Track	Third Track	Fourth Track	Yard Track and Sidings	Total Mileage Operated (all Tracks)
1912 Bureau, 95%......	236,444	24,944	2,528	1,763	90,693	356,372
1911 Official............	*246,124	23,452	2,414	1,747	88,973	362,710
1910 "	*240,831	21,659	2,206	1,489	85,581	351,767
1909 "	*235,402	20,949	2,169	1,453	82,376	342,351
1908 "	*230,494	20,209	2,081	1,409	79,452	333,646
1907 "	227,455	19,421	1,960	1,390	77,749	327,975
1906 "	222,340	17,396	1,766	1,279	73,760	317,083
1905 "	216,973	17,056	1,609	1,215	69,941	306,796
1904 "	212,243	15,824	1,467	1,046	66,492	297,073
1903 "	205,313	14,681	1,303	963	61,560	283,821
1902 "	200,154	13,720	1,204	895	58,220	274,195
1901 "	195,561	12,845	1,153	876	54,914	265,352
1900 "	192,556	12,151	1,094	829	52,153	258,784
1899 "	187,543	11,546	1,047	790	49,223	250,142
1898 "	184,648	11,293	1,009	793	47,589	245,323
1897 "	183,284	11,018	995	780	45,934	242,013
1896 "	182,428	10,685	990	764	44,912	240,129
1895 "	180,657	10,639	975	733	43,888	236,894
1894 "	178,708	10,499	953	710	42,661	233,533
1893 "	176,461	10,051	912	668	42,043	230,137
1892 "	171,563	9,367	852	626	39,941	222,351
1891 "	168,402	8,865	813	599	37,318	215,999
1890 "	163,597	8,437	760	561	35,255	208,612

*Since 1908 the official mileage is exclusive of switching and terminal companies. In 1908 these had 1,624 miles of main track and 2,085 of yard tracks and sidings; in 1909 they reported 1,623 miles of main track and 2,384 of yard tracks and sidings and in 1910 they reported 1,614 and 2,270 miles respectively.

SUMMARY CLASSIFICATION OF LOCOMOTIVES AND THEIR PRINCIPAL CHARACTERISTICS: 1910.

Class.	Number.	Tractive power.	Grate surface.	Heating surface.	Weight exclusive of tender.	Weight on drivers.
		Pounds.	*Sq. ft.*	*Sq. ft.*	*Tons.*	*Tons.*
Single expansion................	55,867	1,502,296,608	1,862,769	117,725,234	4,032,797	3,314,673
Average per locomotive.....	....	26,891	35	2,107	72	59
Four-cylinder compound........	1,511	59,594,482	61,467	5,272,515	168,787	131,278
Average per locomotive.....	....	39,440	49	3,489	112	87
Two-cylinder compound........	862	27,003,390	32,021	2,197,380	72,624	60,858
Average per locomotive.....	....	31,326	39	2,549	84	71
Total......................	58,240	1,588,894,480	1,956,257	125,195,129	4,274,208	3,506,809
Average per locomotive.	....	27,282	35	2,150	73	60

The above table does not include locomotives in the service of terminal companies.

TWO DECADES IN RAILWAY PROGRESS.

RAILWAY RESULTS IN THE UNITED STATES FOR YEARS ENDING JUNE 30, 1892, 1902 AND 1912 WITH PERCENTAGES OF INCREASE BY DECADES.

Item (m=Thousands)	1892	1902	1912	1912 Over 1892 %	1912 Over 1902 %
Population	65,086,000	79,230,563	95,656,000	46.9	20.8
Miles of Line (operated)	162,397	200,154	248,888	53.3	24.3
Miles of All Track	211,051	274,195	370,317	75.5	35.1
Net Capitalization (m)	$8,294,679	$9,925,664	$14,657,545	76.7	47.7
Net Capitalization per Mile of Line	52,348	50,962	61,508	17.6	20.8
Net Capitalization per Mile of Track	40,050	36,921	41,204	3.0	11.6
Revenues from Operation (m)	1,171,407	1,726,380	2,870,736	145.1	66.3
Revenues per Mile Operated	7,213	8,625	11,534	59.9	33.7
Expenses of Operation (m)	780,997	1,116,248	1,990,198	154.8	78.3
Expenses of Operation per Mi. operated	4,809	5,577	7,996	66.3	43.4
Net Revenues from Operation (m)	390,409	610,131	880,538	125.5	44.3
Net Revenues per Mile operated	2,404	3,048	3,538	47.1	16.1
Ratio of Expenses to Revenues	66.67%	64.66%	69.33%	4.0	7.2
Receipts from Passengers (m)	$286,805	$ 392,963	$ 668,642	133.1	70.2
Receipts from Freight (m)	799,316	1,207,228	1,980,805	147.8	64.0
Receipts from Mail (m)	26,861	39,835	51,620	92.2	29.6
Receipts from Express (m)	22,148	34,253	74,735	238.0	118.4
Passengers Carried (m)	560,958	649,878	994,382	77.3	53.0
Passengers Carried 1 Mile (m)	13,362,898	19,689,937	33,510,673	150.8	70.2
Average Receipts per Passenger Mile (cents)	2.126	1.986	1.992	d 6.3	.3
Average Passengers in Train	42	45	57	35.7	26.6
Average Journey per Passenger (miles)	23.82	30.30	33.76	41.7	11.4
Freight Tons Carried (m)	706,555	1,200,315	1,806,173	155.6	50.4
Freight Tons Carried 1 Mile (m)	88,241,050	157,289,370	267,313,687	202.9	69.9
Average Receipts per Ton Mile (mills)	8.98	7.57	7.41	d 17.5	d 2.1
Average Tons in Train	181	296	422	133.1	42.5
Average Haul per Ton (miles)	124.89	131.04	148	19.3	12.9
Locomotives (number)	33,136	41,225	62,291	88.0	51.1
Locomotives Weight without Tender (tons)	1,457,984	2,308,000	4,892,101	235.7	111.9
Passenger Cars (number)	28,876	36,987	51,306	77.7	38.7
Freight Cars (number)	966,998	1,546,101	2,243,465	132.0	45.1
Freight Cars Capacity (tons)	22,240,954	43,416,029	84,129,937	278.2	93.7
Employes (number)	821,415	1,189,315	1,728,603	110.4	45.3
Employes per 100 Miles of Line	506	594	695	37.3	17.0
Employes Compensation	$468,598,170	$676,028,592	$1,268,977,272	170.8	87.7
Proportion of Gross Earnings	40.00%	39.17%	44.20%	9.1	12.8
Proportion of Operating Expenses	60.08%	60.56%	63.76%	6.0	6.0
Taxes	$34,053,495	$54,465,437	$120,873,472	254.9	121.9
Per Mile of Line	209	272	485	132.0	78.3
Proportion of Gross Earnings	2.90%	3.15%	4.21%	45.2	33.6

RAILROAD LOCOMOTIVES AND CARS.

At the end of the year 1911 there were 58 passenger locomotives for every thousand miles of line, 148 freight locomotives, 38 switching locomotives, 5 unclassified, making a total of 249 locomotives per thousand miles of line. There were 9,586 cars per thousand miles of line, divided as follows: 203 passenger cars; 8,920 freight cars; and 463 cars for the company's service. At the end of the same year it was estimated that 66,757 passengers were carried per passenger locomotive; 2,268,097 passenger miles covered per passenger locomotive; 48,007 tons carried per freight locomotive; 6,913,259 ton-miles covered per freight locomotive. For every million passengers carried there were 50 passenger cars, and for every million tons of freight carried there were 1,235 freight cars employed.

At the end of the year 1911 there were 49,818 passenger cars in service; 2,195,511 freight cars; and 114,006 company cars, making a total of 2,359,335 cars in the service. The fast freight line service required 28,138 cars for its service.

Figuring the cost of a locomotive at $15,000, the 60,890 locomotives required for the 236,444 miles of track operated in 1912 cost $913,350,000; the 50,152 passenger cars, valued at $6,500, cost $325,988,000; the freight cars, 2,192,987 in number, valued at $1,000 each, cost $2,192,987,000; and the 113,392 company cars, valued at $600 each, cost $68,035,200. Thus the approximate value of all equipment of American railways was $3,500,360,200. The single item, maintenance of equipment, for the year 1912, amounted to $446,446,230.

ELECTRIC LOCOMOTIVES.

The heaviest electric locomotive on the New Haven has a weight on its drivers of 182,000 pounds, a maximum guaranteed speed of 45 miles, and is designed to trail a load of 800 tons. The Grand Trunk (St. Clair Tunnel) locomotive has a weight on the drivers of 132,000 pounds, a guaranteed speed of 30 miles an hour, and is designed to trail a load of 500 tons. The Pennsylvania R. R. locomotive having a weight on the drivers of 207,800 pounds and a guaranteed speed of 80 miles, is designed to trail a load of 550 tons. The N. Y. C. & H. R. R. R.'s largest electric locomotive, having a weight on the drivers of 141,000, has a guaranteed speed of 75 miles per hour. The Baltimore & Ohio has electric locomotives having a weight of 184,000 pounds on the drivers, a guaranteed speed of 55 miles, and is designed to trail a load of 850 tons. The Paris-Orleans locomotive has a weight on the drivers of 110,000 pounds and a maximum guaranteed speed of 45 miles. The Great Northern's largest electric locomotive has a weight of 230,000 pounds on the drivers and a maximum guaranteed speed of 30 miles.

COST OF LOCOMOTIVES AND CARS.

Locomotives for railway service cost approximately as follows: Mogul, for freight service, having an average weight of 160,000 pounds, cost $14,100; Consolidation, for freight service, average weight 200,000 pounds, cost $18,500; Mallet Compound, for freight service, average weight 400,000 pounds, cost $40,000; Atlantic, for passenger service, average weight 185,000 pounds, cost $15,970; Pacific, for passenger service, average weight 225,000 pounds, cost $20,800; and Ten Wheel, for passenger service, average weight 170,000 pounds, cost $15,000.

Wood box cars (with steel underframe) weighing 36,000 pounds, having a capacity of 100,000 pounds, and inside dimensions of 40′ 6″ x 8′ 10″ x 8′, cost $1,500; steel coal (gondola), weight 46,000 pounds, capacity 110,000 pounds, inside dimensions 46′ x 8′ 9″ x 10′ 6″, cost $1,200; flat cars, weight 34,000 pounds, capacity 100,000 pounds, inside dimensions 40′ 2″ x 9′ 2″, cost $700; day coach, weight 112,000 pounds, capacity 80 passengers, dimensions 78′ 3″ x 10′ x 14′ 5″, cost $8,500; sleeping car (wood), weight 115,000 pounds, capacity 27 berths, inside dimensions 72′ 6″ x 8′ 6″ x 9′ 6″, cost $16,700; sleeping cars (steel), weight 152,300 pounds, capacity 24 berths, inside dimensions 72′ 6″ x 9′ 9″ x 9′ 6″, cost $27,000.

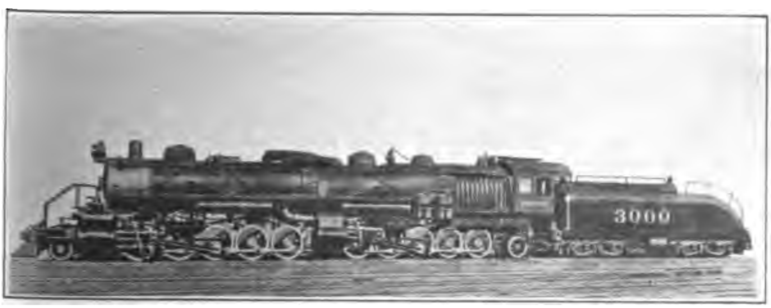
A dining car costs $30,000 to $35,000. A combination café car costs about $28,000. We are indebted to the "World Almanac" for many of these interesting figures.

The Mallet Compound, built for the Atchison, Topeka & Santa Fé, having a total weight of 616,000 pounds, and a weight of 550,000 pounds on its drivers, is the largest and most powerful locomotive in the world. It has ten drivers on each side, having a diameter of 57 inches, and was built by the Santa Fé by converting a 2-10-2 type locomotive by the addition of a front unit. From the tip of the pilot to the end of the tender it is 121 feet 7 inches long. It has a heating surface of 6,579 square feet. Its cylinders are 28 x 38 x 32 inches and its tractive effort is 111,600 pounds. It was built for operation over the A., T. & S. F. from Los Angeles to Albuquerque, where the maximum grade ranges from 2.2 per cent. to 3 per cent. The locomotive burns fuel oil, and the tender has a capacity of 4,000 gallons.

The Mallet Compound passenger locomotive, built by the A., T. & S. F., is the heaviest passenger locomotive ever built. Its total weight is 376,850 pounds and the weight on its drivers, 73 inches in diameter, is 268,400 pounds. It has a heating surface of 4,756 square feet. Its cylinders are 24 x 38 x 28 inches and its tractive effort is 62,850 pounds. It is for use on a division having 2.2 per cent. grades, and over which the schedule speed averages about 25 miles.

SUMMARY OF COST OF LOCOMOTIVE FUEL AND PROPORTION TO EARNINGS AND EXPENSES OF AMERICAN RAILWAYS.

At the end of the year 1912 it was estimated that there were 236,444 miles of railroad and that the total cost of locomotive fuel for operating trains over them was $230,555,544, or 11.85 per cent. of the total operating expenses of the roads or again 8.22 per cent. of the gross earnings of the roads.



This huge locomotive was enlarged at the Santa Fe shops from an existing locomotive by adding the superheater and feed-water sections. The engine weighs 308 tons, the tender 117 tons, making the total weight 425 tons. Its length over all is 120 feet 7½ inches. The H.P. cylinders are 28 inches dia; the L.P. are 38 inches dia.; the common stroke is 32 inches. The max. drawbar pull is 111,000 pounds, and this locomotive has hauled 1,911 tons at 12 miles per hour over a 1.5 per cent grade. On the level it could haul a train so long that the side tracks could not take it in. At a speed of 10 miles an hour, estimated in the usual manner, it would develop about 3,000 horse-power, which at higher speeds, would be still greater. The fire-box has 204 square feet of heating surface, and the tubes 3,625 square feet The gases next pass through the tubes of a superheater of 2,318.4 square feet surface and then through a feed-water heater of 2,659.5 square feet. The steam passes from the steam dome to the superheater; through the high-pressure cylinders; back to the low-pressure superheater; through the low-pressure cylinders, and to the exhaust stack.

SANTA FE MALLET FREIGHT LOCOMOTIVE, THE LARGEST IN EXISTENCE.

SUMMARY OF RAILWAY EMPLOYEES, COMPENSATION AND RATES OF PAY PER DAY BY CLASSES IN 1911, AGGREGATES FROM 1899 TO 1912.

1912 (236,444 Miles Represented) Class	Number	Per 100 Miles of Line	Compensation Total	Average Pay Per Day	Per Cent of Gross Revenues
General Officers	3,622	1.5	$ 18,111,992	$15.22	0.6
Other Officers	9,866	4.2	21,702,497	6.45	0.8
General Office Clerks	77,722	32.9	64,047,042	2 50	2.3
Station Agents	36,862	15.6	29,018,678	2.23	1.0
Other Station Men	161,275	68.2	97,758,363	1.90	3.5
Enginemen	63,260	26.8	101,449,397	5.02	3.6
Firemen	66,423	28.1	61,309,898	3.03	2.2
Conductors	48,792	20.6	67,372,682	4.29	2.4
Other Trainmen	135,508	57.3	127,285,178	3.02	4.5
Machinists	54,467	23.0	52,194,886	3.27	1.9
Carpenters	69,210	29.3	52,027,465	2.57	1.9
Other Shopmen	248,440	105.1	167,095,651	2.25	6.0
Section Foremen	43,113	18.2	30,835,624	2.09	1.1
Other Trackmen	347,433	147.0	133,320,207	1.50	4 8
Switch Tenders, Crossing Tenders and Watchmen	38,783	16.4	23,095,345	1.73	0.8
Telegraph Operators and Despatchers	42,557	18.0	34,701,160	2.46	1.2
Employes acct. Floating Equpt.	11,918	5.1	8,968,119	2.32	0.3
All other Employes & Laborers	231,457	97.9	149,131,100	2.13	5.3
Total (95% Mileage Represented)	1,690,709	715.2	1,239,425,284	2.44	44.20
1911 Official Figures	1,702,164	687	$1,230,186,019	(b) $2.42	43.7
1910	1,732,435	716	1,165,444,855	2.29	41.82
1909	1,528,808	638	1,005,349,958	2.24	41.00
1908	1,458,244	632	1,051,632,225	2.25	43.38
1907	1,672,074	735	1,072,386,427	2.20	41.42
1906	1,521,355	684	(a) 930,801,653	2.09	40.02
1905	1,382,196	637	839,944,680	2.07	40.34
1904	1,296,121	611	817,598,810	No data	41.36
1903	1,312,537	639	775,321,415	No data	40.78
1902	1,189,315	594	676,028,592	No data	39.28
1901	1,071,169	548	610,713,701	No data	38.39
1900	1,017,653	529	577,264,841	No data	38.82
1899	928,924	495	522,967,896	No data	39.81
1898	874,558	474	495,055,618	No data	39.70
1897	823,476	449	465,601,581	No data	41.50
1896	826,620	454	468,824,531	No data	40.77
1895	785,034	441	445,508,261	No data	41.44
1894	779,608	444	No data	No data	....
1893	873,602	515	No data	No data	....
1892	821,415	506	No data	No data	....
1891	784,285	486	No data	No data	....
1890	749,301	479	No data	No data	....
1889	704,743	459	No data	No data	....

(a) Includes $30,000,000 estimate pay-roll of Southern Pacific, whose records were destroyed in the San Francisco disaster.

(b) Bureau computations.

NUMBERS OF DIFFERENT CLASSES OF FREIGHT CARS.

At the close of the year 1910 the several classes or kinds into which freight cars are divided, were as follows: box cars, 966,577; flat cars, 153,918; stock cars, 77,584; coal cars, 818,689; tank cars, 7,434; refrigerator cars, 30,918; and other cars 78,411. The average capacity in tons of a box car was 33; of a flat car 33; a stock car 30; a coal car 41; a tank car 39; a refrigerator car 30; and of other cars 37.

PASSENGER TRAFFIC.

A summary of the passenger traffic for the year 1911 shows that there were 997,409,882 passengers carried; that there were 33,201,694,699 passengers carried one mile; and that the mileage of revenue passenger trains amounted to 572,929,421. The average number of passengers in a train 55; the average journey per passenger was 33.48 miles; and the average revenue per passenger per mile was 1.974 cents. The passenger revenue amounted to $657,638,291.

FREIGHT TRAFFIC.

At the end of the fiscal year 1911 the grand total of freight traffic for the United States amounted to 1,718,014,118 tons, plus 63,623,836 tons—the latter amount being unassigned freight, while the former was assigned. The products of agriculture, having a total freight tonnage of 166,864,072, were divided as follows: Grain, 71,126,786 tons; flour, 19,557,516; other mill products, 15,475,563; hay, 12,033,156; tobacco, 1,706,044; cotton, 7,228,879; fruit and vegetables, 29,108,043; other products of agriculture, 10,628,085 tons.

The products of animals, totaling 41,214,057 tons, were divided as follows: Live stock, 20,416,150; dressed meats, 5,637,469; other packing-house products, 4,809,181; poultry, game and fish, 1,587,942; wool, 1,023,914; hides and leather, 2,653,507; other products of animals, 5,085,894 tons.

From the products of the mines the total freight traffic amounted to 921,129,439 tons and was divided as follows: Anthracite coal, 127,402,064; bituminous coal, 479,638,745; coke, 60,804,241; ores, 133,082,878; stone, sand, and other like articles, 99,352,583; other products of mines, 20,848,929 tons.

The products of the forests, divided into lumber, 125,185,647 tons, and other products of the forest, 61,770,233 tons, amounted to 186,955,880 tons for the year 1911.

The manufactures of the United States, making a total freight tonnage of 267,776,334, were divided according to freight traffic as follows: Petroleum and other oils, 17,596,449; sugar, 6,923,808; naval stores, 1,553,271; iron, pig and bloom, 22,713,623; iron and steel rails, 8,920,596; other castings and machinery, 23,052,502; bar and sheet metal, 29,899,867; cement, brick and lime, 61,082,645; agricultural implements, 3,264,739; wagons, carriages, tools, etc., 3,008,857; wines, liquors and beers, 6,829,700; household goods and furniture, 3,820,113; other manufactures, 79,110,164 tons.

The freight traffic for merchandise amounted to 60,976,778 tons and miscellaneous—other commodities, to 73,097,558 tons.

SUMMARY OF FREIGHT MILEAGE, REVENUE, AND RECEIPTS PER TON MILE.

During the year 1901 the number of tons carried one mile amounted to 147,077,136,040 and during the year 1912 to 261,416,643,000 ; thus making a total increase for the 11 years of 77.5 per cent. The freight revenue for the year 1901 amounted to $1,118,543,014 and for 1912 to $1,936,237,488; making an increase of 73.1 per cent. for the 11 years. The receipts per ton mile in 1901 amounted to 7.50 mills and in 1912 to 7.41 mills.

MAGNITUDE OF LEADING RAILROAD LINES OF THE WORLD REPRESENTED BY SIZE OF LOCOMOTIVES.

PASSENGER AND FREIGHT REVENUES.

Analyzing the revenues of the passenger service for the fiscal year 1890, we find that the revenue per passenger per mile was 2.167 cents; the revenue per passenger carried, $0.50818; the revenue per train-mile, passenger trains, $1.08641; and the passenger earnings per mile of road, $1,978.19. For the freight service for the same year the revenue per ton per mile amounted to 0.927 cents; the revenue per ton of freight carried $1.08781; the revenue per train-mile, freight trains, $1.65434; freight earnings per mile of road, $4,588.82. Thus the total revenue per train-mile for all trains amounted to $1.44231, and the cost of running a train one mile $0.96006.

In 1900 the passenger revenues were as follows: revenue per passenger per mile 2.003 cents; revenue per passenger carried $0.56459; revenue per train-mile, passenger trains, $1.01075; passenger earnings per mile of road $2,067.17. The freight revenues for the same year were: revenue per ton per mile 0.729 cents; revenue per ton of freight carried $0.99373; revenue per train-mile, freight trains, $2.00042; freight earnings per mile of road $5,466.47. Thus the revenue per train-mile for all trains amounted to $1.65721 and the cost of running a train one mile $1.07288.

The passenger revenues for the year 1911 were divided into revenue per passenger per mile, 1.974 cents; revenue per passenger carried, $0.65798; revenue per train-mile, passenger trains, $1.30921; and passenger earnings per mile of road, $3,312.00. On the freight service the revenue per ton per mile amounted to 0.757 cents; the revenue per ton of freight carried $1.07944; the revenue per train-mile, freight trains, $2.89548; the freight earnings per mile of road, $7,895.00. Thus the revenue per train-mile for all trains amounted to $2.24824 and the cost of running a train one mile $1.54338. The term "ton" generally signifies the short ton of 2,000 pounds.

CONSUMPTION OF FUEL OIL.

The increasing use of fuel oil is due to many causes. It has been demonstrated from tests made on some of the railroads accessible to the oil fields and refineries of the West, where fuel oil can be purchased cheaply, that the cost of operating with oil is less and its use equally as efficient as coal, the supplies of which are at times very low and uncertain on account of strikes and shutdowns of mines, and often on account of shortage of cars for the transportation of the coal, especially in the winter season. In some localities where oil is coming into use, as in Nevada, the cost of coal is extremely high. Another reason for the use of oil is the prevention or the elimination of forest fires, which in the last few years have been so disastrous in the northwestern part of the country. In addition to the economy of the use of oil as compared with coal on railroads, it is very much cleaner and safer for the traveler, there being no smoke or cinders.

In 1911 there were 27,368 lines of mile operated by the use of fuel oil. The total quantity of fuel oil consumed by railroads for the same year amounted to 27,774,821 barrels. The total mileage made by oil-burning engines for that year was 104,270,964 and the average number of miles traveled per barrel of oil consumed was 3.75.

REVENUES AND EXPENSES.

A general summary of the monthly reports of revenues and expenses made up by the Bureau of Railway News and Statistics (95% of all roads) shows that the average number of miles operated during 1912 was 236,444. The operating revenue, which amounted to $2,806,177,194, was made up as follows: Passenger, $653,598,401; freight, $1,936,237,488; mail, $50,458,769; express, $73,053,799; other revenues from operation, $92,828,737. The operating expenses, amounting to $2,064,645,750, were

divided as follows: Maintenance of way and structures, $360,446,190; maintenance of equipment, $446,446,230; traffic expenses, $59,895,212; transportation expenses, $1,008,019,735; general expenses, $71,684,564; taxes, $118,153,819. Deducting the total expenses and taxes from the revenues from operation, we have a total operating income of $746,385,701; of this amount, $741,531,444 was derived from rail operations, and $4,854,257 from outside operations.

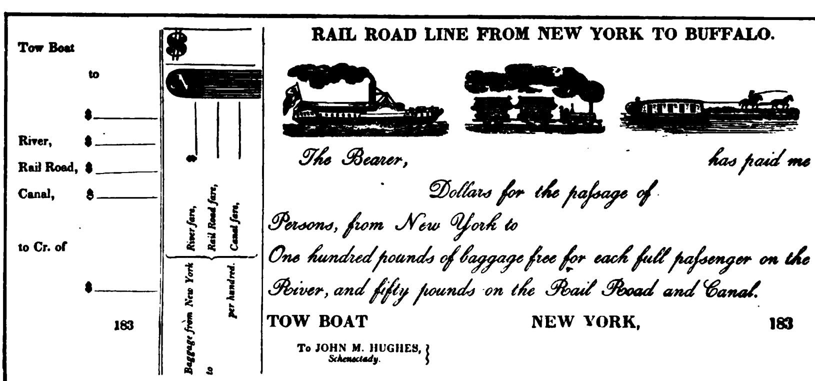
At the close of the year ending June 30, 1890, the railroads had a total of $4,409,658,453 stocks outstanding, of which $1,598,131,933, or 36.24 per cent., were paying dividends. This stock of the railroads paid dividends at an average rate of 5.45 per cent. The railroads paid $87,071,613 dollars in dividends and $221,499,702 interest on the funded debt, making a total of $308,571,315. The interest on interest-bearing current liabilities amounted to $8,114,768.

In 1900 the total stock of the railroads was $5,845,579,593 and the stock-paying dividends amounted to $2,668,969,895, or 45.66 per cent. of the total amount of stock. The average rate paid was 5.23 per cent., making a total of $139,597,972 paid in dividends. The interest on the funded debt amounted to $252,949,616, making a total expenditure on dividends and interest on the funded debt of $392,547,588. The interest on the interest-bearing current liabilities amounted to $4,912,892.

At the end of the year 1911 the total amount of stock paying dividends was $5,730,250,326, or 67.65 of the total amount of outstanding stock. The average rate paid on stock was 8.03 per cent., or $460,195,376. The interest on the funded debt amounted to $410,326,852, making a total of $870,522,228 paid for interest and dividends. The interest on the interest-bearing current liabilities amounted to $26,207,567.

At the end of the fiscal year 1911, the assets for the 244,089.14 miles of line represented were as follows: Net investment in road and equipment, $15,872,462,792; other investments, $4,551,785,530; sundry assets (including deferred debit items), $348,227,510; current accounts, $1,743,499,260; making the total assets $22,515,975.092.

The liabilities for the same number of miles of road and for the same year were as follows: Capital stock, $8,582,463,256; bonded debt (including real estate mortgages, equipment, trust obligations, etc.), $10,989,608,551; unfunded debt (including appropriated surplus), $418,122,751; current accounts, $1,139,377,126; sinking and other funds, $230,573,472. The excess of assets over liabilities was, therefore, $1,155,829,092.


Tow Boat
to
$
River, $
Rail Road, $
Canal, $
to Cr. of
$
183

River fare, Rail Road fare, Canal fare,
Baggage from New York per hundred.

RAIL ROAD LINE FROM NEW YORK TO BUFFALO.

The Bearer, has paid me
Dollars for the passage of
Persons, from New York to
One hundred pounds of baggage free for each full passenger on the River, and fifty pounds on the Rail Road and Canal.
TOW BOAT NEW YORK, 183
To JOHN M. HUGHES, Schenectady.

RAILROAD TICKET OF THE EARLY THIRTIES.

RAILROAD SPEEDS.

Month, day, year.	Railroad.	From.	To.	Dist. Miles.	Time, h. m. s.	Speed miles per H.
6-14-'80	P.R.R.	Philadelphia	Jersey City	90	1:33:00	58.06
0- 0-'80	Gt. N. (Eng.)	London	Grantham	105.5	1:51:00	66.5
4-22-'82	W. Jersey	Camden	Cape May	81.5	1:23:30	58.63
7-12-'83	B. S. & N. Y.	Syracuse	Binghamton	79	1:23:00	57.11
5- 9-'84	P. & R.	N. Y. Div.	M. P. 48	14	0:11:19	74.2
5- 8-'85	L.S.and N.Y.C.	Chicago	New York	964	22:45:00	42.38
7- 9-'85	W. Shore	Alabama	Gen. Junc.	36.3	0:30:00	72.60
6-17-'86	C., B. & Q.	Princeton	Burlington	170	2:58:00	57.3
7- 5-'86	Wabash	K. City	Peru	563	13:45:00	41
8- 8-'86	N. Y. C. & H. R.	Syracuse	Fairport	70.25	1:01:20	68.73
7-10-'88	L. & N. W.-Cal.	London	Edinboro	400	7:52:00	50.85
8- 0-'88	L. & N. W.	Crewe	Preston	51	0:50:00	61.20
8- 0-'88	L. & N. W.	Preston	Carlisle	90	1:30:00	60
8-30-'88	N. E. (Eng.)	York	Newcastle	80.5	1:18:00	62
8-31-'88	Gt. N. (Eng.)	London	Edinboro	392.5	7:26:45	52.7
4- 8-'89	C. & N. W.	Chicago	Council Bluffs	490	12:30:00	39.2
5-19-'89	P., F. W. & C.	Ft. Wayne	Chicago	148.3	2:59:00	49.7
5-26-'89	Mich. C.	S. Bridge	Chicago	511	11:41:00	43.74
3-10-'90	P & R.	Philadelphia	Jersey City	90	1:25:00	63.53
3-10-'90	P. R. R.	Jersey City	Washington	226	4:18:00	52.56
3-10-'90	P. R. R.	Washington	Jersey City	226	4:19:00	52.35
6-22-'91	N. Y. C. & H R.	New York	Buffalo	439.52	8:58:00	49.2
8- 0-'91	Canadian Pac	Vancouver	Brockville	2,792	76:31:00	36.49
9-14-'91	N. Y. C. & H. R.	New York	E. Buffalo	436.32	7:17:30	59.56
10-16-'91	N. Ry. (France)	Paris	Calais	184	3:43:00	49.51
11-28-'91	P. R. R.	Jersey City	Washington	227	4:11:00	54.22
12-22-'91	B. & O.	Philadelphia	Canton	91.6	1:41:00	54.41
3-28-'92	N. Y. C. & H. R.	Oneida	De Witt	21.37	0:17:40	72.69
11-18-'92	Cent. N. J.	Fanwood	....	1	0:00:37	97.3
11-18-'92	P. & R.	Jenkintown	L'horne	5	0:03:25	87.8
12- 0-'92	L. & N. W.	Crewe	Rugby	76	1:11:00	64.23
5- 9-'93	N. Y. C. & H. R.	Grimesville	....	1	0:00:35	102.8
5-19-'93	N. Y. C. & H R.	Syracuse	E. Buffalo	146	2:21:00	62.13
5-19-'93	N. Y. C. & H. R	Looneyville	Grimesville	5	0:03:00	100
5-28-'93	N. Y. C. & H. R. L. S. & M. S.	New York	Chicago	964	19:57:00	48.2
8-28-'93	P., C.. C. & St. L.	Seymour	N. Tower	42	0:35:34	70.96
3-23-'94	C. & N. W.	C. Bluffs	Chicago	488	12:52:00	41.1
4-17-'94	L. S. & M. S.	Cleveland	Erie	95.5	1:35:00	60.32
8-26-'94	A. C. Line	Jacksonville	Washington	780.8	15:49:00	49.36
4- 0-'95	C. B. & Q.	Chicago	G'burg	163	2:45:00	59.27
4-21-'95	Camden & Atl.	Camden	Atlantic City	58.3	0:45:45	76.46
8-21- 95	West Coast	London	Aberdeen	540	8:55:00	60.56
8-21-'95	East Coast	London	Aberdeen	523½	8:40:00	60.35
9-11-'95	N. Y. C. & H. R.	New York	E. Buffalo	436.32	6:51:56	63.54
9-24-'95	N. Y. C. & H. R.	Albany	Syracuse	147.84	2:10:00	68.23
10-24-'95	L. S. & M. S.	Erie	Buffalo	86	1:10:46	72.91
10-24-'95	L. S. & M. S.	Chicago	Buffalo	510.1	8:01:07	63.61
10-24-'95	P. R. R.	Jersey City	Philadelphia	89.6	1:33:21	57.6
5- 7-'96	Mich. C.	Windsor	St. Thomas	11.2	1:43:05	64.72
5- 7-'96	Mich. C.	St. Thomas	Fort Erie	118.2	1:47:15	66.13
6-10-'96	Atlantic City	Camden	Atlantic City	55.5	0:48:00	69.4
6-20-'96	Atlantic City	Camden	Atlantic City	55.5	0:57:00	58.42
7- 3-'96	C., M. & St. P.	Forest Glen	Nat. Ave.	74	1:22:00	54.2
11-21-'96	S. & R.	Weldon	Shops	76.8	1:12:30	63.56
2-15-'97	C., B. & Q.	Chicago	Denver	1,025	18:53:00	54.27
3-11-'97	Char. & Sav.	Cent. Junc.	Ashley J.	102	1:40:00	61.02

RAILROAD SPEEDS—Continued.

Month, day, year.	Railroad.	From.	To.	Dist. Miles.	Time, h. m. s.	Speed miles per H.
4- 9-'97	Atlantic Coast L.	Florence, S. C.	Rocky Mt.	172.2	3:00:00	57.70
4-21-'97	Lehigh V.	Alpine	Geneva Junc.	44	0:33:00	80.
7-14-'97	Atl. City (P. & R.)	Camden	Atlantic City	55.5	0:46:30	71.60
7-16-'97	P., Ft. W. & C.	G. R. & I. Jc	Colehour	132.5	2:15:00	58.8
8- 3-'97	Union Pacific	Evanston	Omaha	955.2	23:55:00	39.93
8- 3-'97	Union Pacific	N. Platte	Omaha	291.0	5:35:00	52.1
11-29-'97	Union Pacific	Cheyenne	Council Bluffs	519	9:19:00	55.7
12- 4-'97	Union Pacific	Sidney	Omaha	414.2	7:12:00	57.5
2-13-'98	Erie	Jersey City	Buffalo	423.	7:30:00	56.4
8-20-'98	Atlantic City	Camden	Atlantic City	55.5	0:46:45	71.2
1- 2-'99	Chic., B. & O.	Omaha	Chicago	500.2	8:43:00	57.38
4-23-'99	Chic., B. & O	Clyde	Burlington	197.3	3:04:00	64.33
7- 9-'99	Del., L. & W.	Bath	East Buffalo	104	1:30:00	69.30
7-19-'99	Vandalia	Clayton	Transfer	18	0:14:00	77.00
7-22-'99	Atlantic City	Camden	Atlantic City	55.5	0:51:15	65.00
7-31-'99	W. J. & S. (Penn.)	Camden	Atlantic City	58 3	0:50:30	69.30
10- 7-'99	Penn. W. Pittsburgh	Ft. Wayne	Chicago	148.3	2:50:00	52.30
10-14-'99	Wabash	Tilton	Granite City	176.6	2:47:30	63.30
11-22-'99	L. S. & M. S.	Buffalo	Cleveland	183	3:25:00	......
3-27-'00	Atch., T. & S. F	Los Angeles	Chicago	2,236	58:00:00	38.55
4-30-'00	Chic., B. & Q.	Burlington	Chicago	205.8	3:23:00	60 80
7- 9-'00	N. Y. C. & H. R.	Rochester	Syracuse	80.7	1:25:00	56.70
7- 4-'00	Atlantic City	Camden	Atlantic City	55.5	0:44:15	75.20
8-16-'00	Atlantic City	Camden	Atlantic City	55.5	0:44:15	75.20
9-30-'00	Penn. Lines	Ft. Wayne	Clarke J.	126	2:38:00	47.90
12-21-'00	Burlington	Omaha	Billings	892.6	16:23:00	54.40
3- 1-'01	Sav., F. & W.	M. P. 69	M. P. 74	4.8	0:02:40	107.90
9- 5-'01	Mich. Cent.	Susp. Bridge	Windsor	229	3:40:00	62.45
2- 9-'02	N. Y., N. H. & H.	Harlem R.	Boston	228	4:12:00	54.30
3-24-'02	Penn.	Philadelphia	Jersey City	89.8	1:19:00	68.17
3-24-'02	Burlington	Eckley	Wray	14.8	0:09:00	98.66
6-21-'02	Penn.	Harrisburg	Altoona	131.4	2:10:00	60.70
5-25-'03	L. S. & M. S.	Toledo	Elkhart	133.4	1:54:00	70.20
6-19-'03	L. & N. W.	London	Carlisle	299.2	5:58:00	50.14
8- 8-'03	A. T. & S. F.	Chicago	Los Angeles	2,267	52:49:00	42.80
4-27-'04	Mich. Cent.	Niagara Falls	Windsor	225.7	3:18:00	68.38
6- 9-'04	Gt. Western	Plymouth	London	246.8	3:46:48	65.30
7-20-'04	Atlantic City	Camden	Atlantic City	55.5	0:43:00	77.40
5-14-'05	Atlantic City	Atlantic City	Camden	55.5	0:42:33	78.26
6- 8-'05	Penn.	E. Tolleston	Donaldson	50	0:38:00	79.00
6-13-'05	L. S. & M. S.	Chicago	Buffalo	525	7:33:00	69.53
0- 0-'05	N. Y. C. L. S. & M. S.	New York	Chicago	964	18:00:00	53.55
7- 9-'05	A. T. & S. F.	Los Angeles	Chicago	2,246	44:54:00	50.00
10-23-'05	Southern Pac. Union Pac. Chic. & No.West. L. S. & M. S. Erie	Oakland	Jersey City	3,239	73:12:00	44.30
10-23-'05	Penn.	Crestline	Ft. Wayne	131.4	1:41:20	77.81
10-24-'05	Penn.	Crestline	Clarke J.	257.4	3:27:20	74.55
11- 3-'05	Penn.	Harrisburg	Chicago	717	12:49:00	56.00
5- 5-'06	Southern Pac. Union Pac. Chic & N. W. L. S. & Mich.So. N. Y. Cent.	Oakland	New York	3,255	71:27:00	45.60
6-19-'06	Atlantic City	Camden	Atlantic City	55.5	0:43:30	76.70

*From *Locomotive Dictionary*.—Courtesy *Railroad-Age-Gazette*.

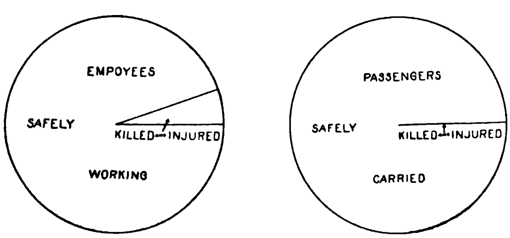
LATEST RAILROAD SPEEDS.

Month, day, year.	Railroad.	From.	To.	Dist. Miles.	Time, h. m. s.	Speed miles per H.
3-28-'09	N. Y. C. L. S.	Mott Haven	Chicago	959	16:30:00	58.12
7-29-'09	L. S. M. C.	Toledo	Elkhart	134	1:50:00	73.08
8-16-'09	C. & N. W.	Chicago	St. Paul	409	7:24:00	54.05
8-17-'09	C. & N. W.	St. Paul	Chicago	409	7:24:00	54.05
10- 2-'09	U. P.	Omaha	Denver	575	12:30:00	46.0
1-17-'10	N. Y. C. L. S.	New York	Chicago	964	18:30:00	52.1
5-21-'10	Mich. C.	Windsor	Falls View	224	3:44:00	60.0
12- 0-'10	C. of N. J.	Jersey City	Washington	227	4:04:00	55.8
2-16-'11	S. P. R. Is. N. Y. C.	Yuma	New York	2,787	74:19:00	40.41
2-28-'11	P. R.	Altoona	Philadelphia	235.1	3:29:00	67.5
2- 0-'11	P. R.	Washington	New York	226.8	3:55:30	57.8
12-22-'11	C. & N. W.	Chicago	Clinton	138	2:16:00	59.1
4-00-'11	N. Y. C.	Syracuse	Buffalo	149	2:20:00	63.84
4-00-'11	C. of N. J.	Philadelphia	Jersey City	90	1:42:00	52.9

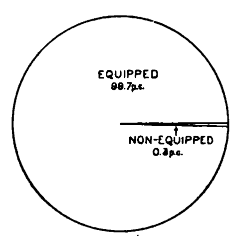
Courtesy Railroad-Age-Gazette.

RAILWAY MAIL REVENUES.

Year	Railway Mail Revenues	Number of Railway Mail Clerks	Postal Revenues
1902	39,963,248	9,627	121,848,047
1903	41,709,396	10,418	134,224,443
1904	44,499,732	11,621	143,482,624
1905	45,426,125	12,474	152,826,585
1906	47,371,453	13,598	167,932,783
1907	50,378,964	14,357	183,585,006
1908	48,517,563	15,295	191,478,663
1909	49,380,783	15,866	203,562,383
1910	48,913,888	16,578	224,128,657
1911	50,702,625	16,792	237,879,823
1912	50,458,769	16,636	246,744,015
Ten years' increase, per cent	28.8%	72.8%	101.7%



Risk of Employees and Passengers on American Railways.



Safety Appliances on American Railways.

RAILWAY SPEED IN ENGLAND.

The Fastest Running, without stoppage, is made by the Companies as under:—

Company.	Train.	From	To	Time. H.	Time. M.	Distance. Miles.	Average Speed.
North Eastern	1. 9	Darlington	York	0	43	44¼	61·7
Great Central	4.33	Leicester	Nottingham	0	22	22½	61·3
Great Western	11. 0	Paddington	Bath	1	48	106⅞	59·4
Great Northern	12. 7	Peterborough	King's Cross	1	18	76¼	58·6
Midland	10.10	Kettering	Bedford	0	23	22¼	58·0
London and North Western	9.31	Willesden	Coventry	1	32	88½	57·7
London and South Western	5. 3	Basingstoke	Vauxhall	0	49	46½	56·9
Caledonian	5.58	Perth	Aberdeen	1	37	89¼	55·9
Lancashire and Yorkshire	8.40	Liverpool	Manchester	0	40	37	55·5
Cheshire Lines	5.10	Manchester	West Derby	0	34	31¼	55·1
Great Eastern	2.43	Lincoln	Spalding	0	44	40¼	54·8
Glasgow and South Western	2. 6	Kilmarnock	Dumfries	1	4	58	54·6
Great Southern and Western	12.36	Ballybrophy	Mallow	1	28	77¾	53·0
South Eastern and Chatham	4.51	Tonbridge	Ashford	0	31	26½	51·3
London, Brighton & South Coast	11. 0	Victoria	Brighton	1	0	51	51·0
London, Tilbury & Southend	4.13	Stepney	Westcliff	0	39	33	50·8
Hull and Barnsley	9. 7	Hemsworth	Howden	0	30	25	50·0
Great Northern (Ireland)	6.56	Drogheda	Dublin	0	39	31¾	48·8
North British	9.12	Haymarket	Cowlairs	0	55	44½	48·5
Highland	11. 5	Blair Athol	Perth	0	45	35¼	47·0
North Stafford	1. 8	Crewe	Rhyl	1	7	51¼	45·9

The Longest Runs without Stoppage are made by the Companies as under:—

Company.	Train.	From	To	Time. H.	Time. M.	Distance. Miles.	Average Speed.
Great Western	10.30	Paddington	Plymouth	4	7	225¾	54·8
London and North Western	11.10	Euston	Rhyl	3	58	209¼	52·7
Midland	11.50	St. Pancras	Shipley	4	3	206	50·38
Great Northern	2.20	Wakefield	King's Cross	3	5	175¾	57·0
Great Central	3.15	Marylebone	Sheffield	2	57	164¼	55·8
Caledonian	1.42	Carlisle	Perth	3	3	150¾	49·5
Great Eastern	1.30	Liverpool Street	North Walsham	2	38	131	49·7
North Eastern	11.14	Newcastle	Edinburgh	2	18	124½	54·1
London and South Western	4.10	Waterloo	Bournemouth	2	0	108	54·0
North British	9.30	Edinburgh	Carlisle	2	11	98¼	45·1
Glasgow and South Western	2. 6	Kilmarnock	Carlisle	1	46	91¼	51·5
Great Southern and Western	1.40	Thurles	Dublin	1	40	86¾	52·0
London Brighton & South Coast	1.48	Clapham Junct.	Fratton	1	59	81¾	41·2
South Eastern and Chatham	11. 0	Victoria	Dover Town	1	40	77¾	46·1
Highland	11.50	Perth	Newtonmore	1	54	*68½	36·1
Mid. and Great Northern Joint	2.38	Peterborough	Melton Const'ble	1	37	*68¼	42·2
Somerset and Dorset	2.13	Bath	Poole	1	39	*67	40·6
Lancashire and Yorkshire	8. 0	Blackpool	Halifax	1	52	60	32·7
Midland Great Western	5.58	Mullingar	Dublin	1	14	50	40·5

* Single line, wholly or partly.

FASTEST LONG-DISTANCE TRAINS.

Railway.	From.	To.	Miles.	Speed, miles per hour.
Northern (France)	Paris	Calais	185.1	59.72
Prussian	Berlin	Hamburg	177.69	52.51
London & North West	London	Edinburgh	393.5	50.77
N. Y. C. & L. S. & M. S.	New York	Chicago	962.49	50.66
Caledonian	London	Edinburgh	401.5	50.18
P. L. & M. (France)	Paris	Mentone	687.5	49.10
Pennsylvania	New York	Chicago	897.0	47.21
Orleans (France)	Paris	Bayonne	488.0	49.3
N. Y. C. & H. R.	New York	Buffalo	440.0	49.3
O. & S. (France)	Paris	Madrid	903.0	38.49
Various	Ostend	Vienna	822.0	37.85

From the June, 1912, Railway and Locomotive Engineering.

The Loetschberg Railway Tunnel through the Bernese Alps entailed an expenditure of $20,000,000. It is nine miles long, and is therefore the third largest in Europe. It gives a direct connection with the Simplon Tunnel Railway, and shortens the route from Milan to Calais by about eighty miles.

RAILROAD ACCIDENTS.

During the year 1900 there were 2,550 employees of the railroads killed and 39,643 injured, or for every 399 men employed one was killed and for every 26 men employed one was injured. In 1909 the total number of employees killed was 2,610 and of those injured 75,006, or for each 576 men employed one man was killed and for each 20 men employed one was injured.

The total number of passengers killed during the year 1900 was 249 and of those injured 4,128, or for every 2,316,591 passengers carried one was killed and for every 139,736 carried one was injured. In 1909 253 passengers were killed and 10,311 injured, or for every 3,523,606 carried one was killed and for every 86,458 carried one was injured.

The number of other persons killed for the year 1900 was 5,066 and during 1909, 5,859; while those injured in 1900 numbered 6,549 and in 1909, 10,309. The total number of persons killed during 1900 was 7,865 and of those injured 50,320, and in 1909 total of those killed was 8,722 and of those injured 95,626.

During the year 1912 there were 270 passengers killed in railway accidents; 3,283 employees, 5.424 trespassers and 1,198 other persons, not trespassers, making the total for the year 10,185, as compared with 9,957 in 1911 and 9,682 in 1910.

During the year 1912 the railroads paid to persons on account of injuries a total amount of $27,640,851, or 0.86 per cent of earnings. Of this amount, $2,034,485 was paid as a result of maintenance of way; $1,844,039 as maintenance of equipment; $23,762,327 as transportation.

Another loss of $34,197,285 incurred by the railroads was divided as follows: Loss and damage to freight, $24,953,843; to baggage, $304,925; to property, $4,846,165; to live stock, etc., $4,092,352. This amount was 1.13 per cent of the net earnings of the railroads.

SAFETY APPLIANCES.

In the mater of safety appliances, American railroads are far more completely equipped than the railways of any other country. With those twin devices for the protection of trains and employees, train brakes and automatic couplers, their equipment is practically complete—the proportion being 98% and 99.7%, respectively.

BLOCK SIGNALS.

At the end of the year 1912, 22,236 miles of track were equipped with automatic block signals; 55,719 with non-automatic block signals and 276 miles not classified, thus making a total of 78,231 miles having a block signal system of some sort. The total number of miles having a block signal system in 1911 was 76,408, thus making an increase in 1912 of 1,823 miles of line. After elaborate investigations, the cost of installing and maintaining the block signal system, was reported as follows: Cost of installation of automatic block signals on railway mileage not equipped, $286,492,976; annual cost for maintenance, depreciation and interest charge, $73,751,012. The estimated cost of installation was $1,232 per mile, and for maintenance, $169 per mile of track per year.

TRAIN SERVICE.

During the year ending March 31, 1909, the steam railroads of the State of New York ran 650,592 trains or an average of 54,216 each month. During 1910 they report 703,816 trains, or 58,651 a month; and during 1911, 758,833, or 63,236 a month. For this period of three years an average of 83.4 per cent. of the trains were on time. For each train the average delay was 25.96 minutes. The principal causes of delay were: waiting for trains on other divisions, 32.6 per cent.; train work at stations, 14.3 per cent.; waiting for train connections with other railroads, 13 per cent.; trains ahead, 7.5 per cent.; engine failures, 7.1 per cent.; meeting and passing trains, 6.3 per cent.; and wrecks, 5.7 per cent.

There are 47 steamships engaged in cable-laying and repairing.

SUMMARY OF CASUALTIES TO PERSONS IN RAILWAY ACCIDENTS FOR THE YEARS ENDING JUNE 30, 1911, AND 1912.

	1912		1911	
	Killed	Injured	Killed	Injured
Passengers:				
Collisions	49	4,184	55	3,176
Derailments	65	3,956	39	2,374
Other Accidents to Trains	....	76	....	90
Other Causes	156	6,125	187	5,753
Total Passengers	270	14,291	281	11,393
Employes on Duty:				
Collisions	292	3,592	335	3,567
Derailments	251	3,015	258	2,258
Other Accidents to Trains	78	1,716	75	1,858
In Coupling Accidents	192	3,235	209	2,966
Overhead Obstructions	77	1,523	76	1,510
Falling from Cars	573	13,874	539	12,989
Other Causes	1,505	24,260	1,454	22,740
Total Employes	2,968	51,215	2,946	47,281
Total Passengers and Employes on Duty	3,238	65,506	3,227	59,281
Employes not on Duty:				
In Train Accidents	20	156	13	174
In Coupling Accidents	....	2	....	....
Overhead Obstructions	1	12	2	13
Falling from Cars	53	312	49	357
Other Causes	241	477	223	410
Total	315	959	292	954
Other Persons:				
Not Trespassing—				
In Train Accidents	13	277	11	175
Other Causes	1,185	4,746	1,143	4,898
Total	1,198	5,023	1,154	5,073
Trespassers:				
In Train Accidents	91	151	81	141
Other Causes	5,343	5,536	5,203	5,473
Total	5,434	5,687	5,284	5,614
Total Accidents Involving Train Operation	10,185	77,175	9,957	70,922
Industrial Accidents to Employes:				
Not Involving Train Operation	400	92,363	439	79,237
Grand Total	10,585	169,538	10,396	150,159
1910	9,652	119,507	....	....
1909	8,722	95,626	....	....
1908	10,188	104,230	....	....
1907	11,839	111,016	....	....
1906	10,618	97,706	....	....
1905	9,703	86,008	....	....
1904	10,046	84,155	....	....
1903	9,840	76,553	....	....
1902	8,558	64,662	....	....
1901	8,455	53,339	....	....
1900	7,865	50,320	....	....
1899	7,123	44,620	....	....

DENSITY OF POPULATION.

Egypt proper is the most densely populated country, having 931 per square mile. Belgium comes next with 660, then Holland. The United Kingdom has 373, Japan 336, after which come the other European Countries down to Russia with 63.7 and Sweden with 31.8. The United States has only 30.9, and the South American Republics all less. Australia contains only 1.38 persons per square mile. In England there is an average of just about 1 person per acre.

Lord Rayleigh has recently made some interesting experiments to determine the colors of the sea and sky. Other experimenters, such as Davy, Bunsen, and Spring, were all satisfied that the color of water was blue, but Lord Rayleigh's experiments have supplied only limited confirmation of that view. What appears to be the intrinsic color of the sea he finds is often due to the color of the sky or is affected by the color of the bottom. With carefully distilled water he got the same blue color of water as the water from Capri and Suez, while that from Seven Stones Lightship, off the Cornish coast, gave a full green.

KILLED IN EUROPEAN RAILWAY ACCIDENTS.

Country	Year	Passengers	Employes	Other Persons	Total	Preceding Year
United Kingdom	1911	112	446	601	1,159	1,121
Germany	1910	97	543	624	1,264	1,394
Russia (a)	1908	198	645	1,866	2,709	2,950
France	1909	(b) 8	351	c 333	692	625
Austria	1910	29	112	153	294	313
Hungary	1910	24	140	189	353	356
Italy	1910-11	25	107	209	341	438
Spain	1907	25	64	213	302	219
Portugal	1904	....	....	....	55	37
Sweden	1909	6	32	59	97	91
Norway	1910-11	1	7	8	16	13
Denmark (d)	1910-11	1	9	16	26	30
Belgium	1910	11	71	70	152	05
Holland	1909	3	20	9	32	37
Switzerland	1910	7	32	46	85	99
Roumania	1910-11	7	28	69	104	18
Total Europe		554	2,607	4,465	7,626	7,797
Europe (e)	1910	692	2,689	4,461	7,897	....
"	1909	671	2,641	4,322	7,689	....
"	1908	630	2,536	3,580	6,803	....
"	1907	586	2,575	3,400	6,606	....
"	1906	560	2,319	3,553	6,432	....
"	1905	503	2,104	3,414	6,021	....
"	1904	412	1,920	2,665	4,995	....

(a) Exclusive of local lines and railways of Finland.

(b) In train accidents only.

(c) Excluding suicides, but including passengers killed otherwise than in train accidents.

(d) State railways only.

(e) These figures are those compiled for this Bureau each year since its organization, the details for each country appearing in the report of the report for the following year.

STATISTICS OF THE PULLMAN COMPANY.

The report rendered by the Pullman Company for the year ended June 30, 1911, places the average mileage (single track) over which operations were conducted at 120,871 miles. The cost of the property and equipment required for the service amounted to $116,026,015. The operating revenues are divided into berth revenue, $31,415,913; seat revenue, $5,585,556; charter of cars, $601,498; and other miscellaneous revenues to make the total operating revenues $35,697,582. The conductors employed on the Pullman cars, 2,274 in number, receive an average daily compensation of $2.82; the 6,317 porters employed receive an average daily compensation of $1.04; and the 8 stenographers employed by the service receive an average daily compensation of $2.31.

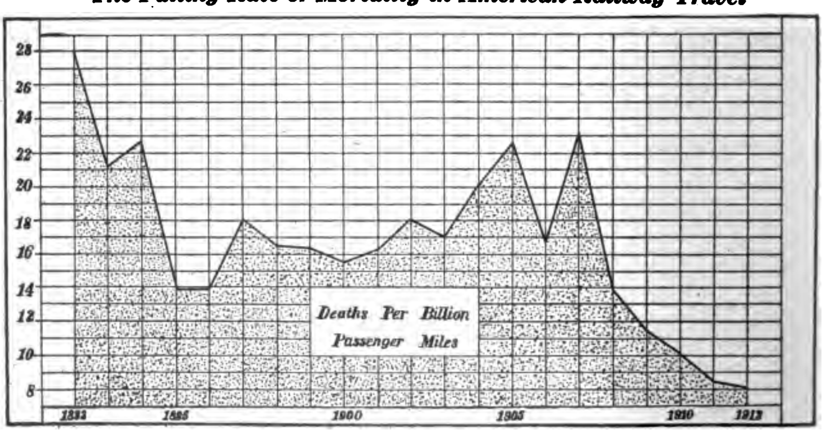
OPERATING STATISTICS.

Total number of revenue passengers—berth	12,435,404
Total number of revenue passengers—seat	9,219,648
Average revenue per passenger—berth	$2.53
Average revenue per passenger—seat	$0.61
Total number of car-miles	625,589,998
Total number of car-days	1,567,916
Average number of revenue passengers per car per day	14
Operating revenues per car-mile (cents)	5.706
Operating revenues per car-day	$22.76753
Operating expenses per car-mile (cents)	4.143
Operating expenses per car-day	$16.52929
Net operating revenue per car-mile (cents)	1.563
Net operating revenue per car-day	$6.23823
Average number of car-miles per car-day	399

EQUIPMENT (OWNED OR LEASED) IN SERVICE ON JUNE 30, 1911.

Standard sleeping cars	4,155
Tourist sleeping cars	744
Parlor cars	807
Dining cars	24
Composite cars	142
Private cars	36
Miscellaneous cars	4
Total	5,912

The Falling Rate of Mortality in American Railway Travel



New York Times Annalist.

EXPRESS COMPANIES.

In its Twenty-sixth Annual Report the Interstate Commerce Commission publishes a statement of the income account of express companies as reported to it for the years ending June 30, 1910, 1911 and 1912, the salient features of which are as follows:

Item	1912	1911	1910
Number of Companies	12	13	13
Railway Miles Operated	248,618	243,472	237,868
Express Operations:			
Gross Receipts from Operation	$160,121,932	$152,612,880	$146,116,315
Less Express Privileges	78,576,274	73,936,018	69,917,562
Operating Revenues	$81,545,658	$78,676,862	$76,198,753
Operating Expenses	73,225,682	67,089,233	61,690,473
Net Operating Revenue	$ 8,289,976	$11,587,629	$14,508,280
Net Revenue from Outside Operations	(a) 46,622	13,117	10,527
Total Net Revenue	$ 8,243,353	$11,600,746	$14,518,807
Taxes Accrued	1,430,809	1,315,973	1,126,726
Operating Income	$ 6,812,544	$10,284,773	$13,392,081
Other Income from Investments, etc	5,369,822	6,315,842	5,633,792
Gross Income	$ 12,182,366	16,600,615	19,025,873
Total Deductions, Interest, etc	1,237,996	1,234,006	1,037,316
Net Corporate Income	$10,944,370	$15,366,609	$17,988,557
Dividends Declared	4,625,832	5,848,082	5,928,103

(a) Deficit.

CLASSIFICATION OF MILEAGE COVERED BY OPERATIONS OF EXPRESS COMPANIES ON JUNE 30, 1911.

Name of carrier.	Total mileage.	Steam-road mileage.	Electric-line mileage.	Steamboat-line mileage.
	1911	1911	1911	1911
Total	270,666.37	243,721.41	7,291.94	18,939.65
Adams Express Co	36,560.52	32,784.94	314.58	3,438.00
American Express Co	56,877.95	54,344.00	590.70	1,919.75
Canadian Express Co	7,230.31	6,400.31	66.00	737.00
Canadian Northern Express Co	3,391.80	3,369.80	22.00	....
Globe Express Co	2,903.63	2,903.63	....	....
Great Northern Express Co	8,803.54	8,466.15	197.39	140.00
National Express Co	1,640.25	1,422.25	70.00	148.00
Northern Express Co	7,625.88	7,310.48	54.00	261.00
Pacific Express Co	16,980.65	15,938.11	539.20	503.34
Southern Express Co	32,580.60	31,654.60	80.00	846.00
United States Express Co	32,748.28	28,836.99	3,444.59	466.70
Wells Fargo & Co	58,471.56	45,446.75	1,909.08	10,475.86
Western Express Co	4,851.40	4,843.40	4.00	4.00

STREET AND ELEVATED RAILWAYS: MILEAGE, NUMBER OF CARS, AND CAPITALIZATION BY STATES.

[Source: The Electric Railway Journal.]

State.	Number of companies.	Electric railways, track mileage.	Number of cars.	Capital stock outstanding.	Funded debt outstanding.
				Dollars.	*Dollars.*
Alabama	11	299.66	606	18,232,000	16,025,000
Arizona	5	57.50	41	2,550,000	50,000
Arkansas	9	106.80	247	5,859,600	6,919,500
California	45	2,250.59	4,241	331,642,300	143,604,500
Colorado	16	449.85	735	19,429,400	29,671,000
Connecticut	10	1,264.72	2,841	60,137,800	38,884,000
Delaware	6	55.25	87	8,870,000	4,979,000
District of Columbia	6	312.04	1,514	30,492,800	33,618,019
Florida	7	128.10	239	5,266,000	4,482,500
Georgia	12	410.24	702	50,989,600	26,412,500
Idaho	5	88.00	54	4,784,000	1,418,000
Illinois	72	3,264.08	8,104	153,991,500	266,020,308
Indiana	35	2,245.71	2,138	83,216,630	84,071,650
Iowa	27	751.06	1,436	37,256,925	36,538,500
Kansas	15	258.95	370	5,683,220	6,013,000
Kentucky	10	459.36	958	22,824,300	22,819,800
Louisiana	8	265.86	728	31,380,000	34,321,500
Maine	15	514.50	781	16,016,500	14,925,225
Maryland	12	713.68	2,025	22,731,550	70,437,800
Massachusetts	56	3,449.22	10,409	108,569,900	76,054,200
Michigan	23	1,494.05	2,663	45,410,200	72,631,000
Minnesota	10	505.97	1,000	25,589,000	23,261,000
Mississippi	11	116.10	186	6,932,670	6,441,000
Missouri	19	1,080.59	2,594	82,771,480	114,695,700
Montana	7	154.68	166	3,179,615	1,890,000
Nebraska	6	242.50	550	12,647,500	11,449,000
Nevada	2	10.30	12	1,042,000	135,000
New Hampshire	19	267.10	368	4,212,700	8,732,000
New Jersey	50	1,371.14	2,874	67,472,390	92,106,100
New Mexico	3	10.50	11	400,000	150,000
New York	139	4,749.83	17,342	408,845,674	546,213,437
North Carolina	13	181.23	251	23,483,800	10,867,400
North Dakota	3	23.50	59	440,000	200,000
Ohio	95	4,048.93	5,909	204,279,875	128,761,940
Oklahoma	15	231.86	281	10,046,300	7,241,000
Oregon	7	399.89	1,223	40,740,000	47,960,000
Pennsylvania	245	4,325.33	9,359	248,705,799	220,602,546
Rhode Island	12	438.50	1,269	22,285,100	16,191,118
South Carolina	6	118.20	178	8,379,950	5,474,000
South Dakota	8	20.00	32	600.000	200,000
Tennessee	13	364.88	868	21,508,000	27,297,000
Texas	29	642.72	1,048	32,454,700	23,483,000
Utah	4	241.30	341	7,877,725	6,996,000
Vermont	9	101.75	124	2,880,800	2,800,000
Virginia	18	456.27	893	28,068,650	33,906,100
Washington	19	931.79	1,947	61,463,900	44,096,000
West Virginia	21	411.86	590	17,740,100	17,792,700
Wisconsin	24	720.55	1,042	23,729,200	40,532,500
Wyoming	2	22.00	21	75,000	20,000
Total, 1911	1,209	41,028.49	91,457	2,433,186,153	2,424,334,533

NOTES TO PAGE 261.

*The net capital liability of the Canadian railways, exclusive of Government owned roads, in 1912 was $1,378,937,726 or $51,593 per mile, which is far below their "capital cost."

In 1912 the railways of Canada paid $2,200,528 taxes. In Nova Scotia and New Brunswick they are exempt from taxation.

RAILWAYS OF CANADA,

STATISTICS OF THE RAILWAYS OF THE DOMINION FOR THE YEARS ENDING JUNE 30, 1908, 1911 AND 1912.

	1908	1911	1912
Miles of Line Operated	22,966	25,400	26,727
Second Track	1,211	1,610	1,752
Yard Track and Sidings	4,546	5,550	6,149
All Tracks	28,723	32,560	34,629
Capital Cost*			
Stock	$607,425,349	$749,207,687	$770,459,351
Funded Debt	631,869,664	779,481,514	818,478,175
Government Railways	109,423,104	119,615,666	133,306,218
Subsidies	166,291,482	202,179,254	204,932,573
Total Capital Cost	$1,515,009,559	$1,850,484,121	$1,926,906,317
Per Mile of Line	65,968	72,854	72,129
Passenger Traffic			
Passengers Carried	34,044,992	37,097,718	41,124,181
Passengers Carried 1 Mile	2,081,960,864	2,605,968,924	2,910,251,636
Average Journey (miles)	61	70	71
Average Passengers per Train	54	60	62
Mileage of Passenger Trains	31,950,349	36,985,911	40,440,393
Mileage of Mixed Trains	6,210,807	6,277,468	6,473,882
Receipts from Passengers	$39,992,503	$50,566,894	$56,543,664
Receipts per Passenger Mile (cents)	1.920	1.944	1.943
Freight Traffic			
Tons Carried	63,019,900	79,884,282	89,444,331
Tons Carried 1 Mile	12,961,512,519	16,048,478,295	19,558,190,527
Average Haul (miles)	206	200	218
Freight Train Mileage	40,476,370	52,498,866	60,126,023
Average Tons per Train	278	305	325
Receipts from Freight	$93,746,655	$124,743,015	$148,030,260
Receipts per Ton Mile (mills)	7.23	7.77	7.57
Miscellaneous Receipts	$13,179,155	$13,423,585	$14,829,819
Total Receipts	$146,918,313	$188,733,493	$219,403,752
Expenses of Operation			
Way and Structures	$20,778,610	$29,245,093	$31,514,093
Maintenance of Equipment	20,273,626	26,127,638	29,811,510
Traffic Expenses	....	4,831,744	5,293,700
Conducting Transportation	62,486,270	66,343,270	78,969,543
General Expenses	3,765,636	4,487,039	5,137,688
Total Expenses	$107,304,142	$131,034,784	$150,726,539
Ratio to Earnings	73.04%	69.44%	68.7%
Net Receipts	$39,614,171	$57,698,709	$68,677,213
Percentage to Capital Cost	2.61%	3.12%	4.27%
Gross Receipts per Mile	$6,398	$7,430	$8,209
Gross Expense per Mile	4,672	5,158	5,639
Number of Employes	106,404	141,224	155,901
Compensation	$60,376,607	$74,613,738	$87,299,639
Proportion of Gross Earnings	41.10%	39.53%	39.79%
Proportion of Operating Expenses	56.27%	56.94%	57.92%
Average per Employe per Year	$569	$528	$560

CANADIAN RAILWAYS.

ACCIDENTS, ELECTRIC RAILWAYS.—In 1911 the killed numbered 11 passengers, 8 employees, 83 others; total 102. Injured, 1,784 passengers, 300 employees, 586 others; total 2,670.

ACCIDENTS, STEAM RAILWAYS, 1911.—Passengers, 28 killed, 288 injured; employees, 202 and 1,314; trespassers, 185 and 154; non-trespassers, 48 and 135; postal clerks, 2 and 15; total killed 465; injured, 1906.

CAPITAL INVESTED IN CANADIAN STEAM RAILWAYS.—In 1911 the total capital invested in Steam Railways was $1,528,689,201, composed of shares, $749,207,687, and funded debt, $779,481,514; in Electric Railways, $111,532,347, including shares $62,251,203, and funded debt, $49,281,144.

EARNINGS OF STEAM RAILWAYS.—Net earnings for all railways in 1911, $57,698,709; operating expenses, $131,034,785.

ELECTRIC RAILWAY STATISTICS.—In 1911, paid-up capital invested, $111,532,347; mileage, 1,224; gross earnings, $20,356,951; operating expenses, $12,096,134; net earnings, $9,944,153. Passengers carried, 426,296,792. Freight carried, 2,496,072 tons.

EXPRESS AND TELEGRAPH COMPANIES.—The Dominion Express Co. and the C. P. R. Telegraph operate along the lines of the Canadian Pacific Ry. The Canadian Northern Express Co. and the Canadian Northern Telegraph Co. along the lines of the Canadian Northern Ry., and the Canadian Express Co. (Pres., Chas. M. Hays; Vice-Pres., James Bryce), with the Great North-Western Telegraph Co., operates along the lines of the G. T. Ry. This, the first Express Co. in Canada, was founded as the British N. American Co. in 1854, and reorganised in 1865.

GRAND TRUNK PACIFIC.—The main line, Moncton, N. B., to Prince Rupert, B. C., with 3,560 miles, will be entirely on Canadian soil, forming a link on the proposed All-Red Route. The line between Winnipeg and Edson, 923 miles, also between Westfort and Lake Superior Junction, 189 miles, is completed. The section between Winnipeg and Lake Superior Junction is also nearing completion. This will give a continuous track from Port Arthur and Ft. William to Edson, 1,370 miles. Construction easterly from Prince Rupert was begun early in 1908, and steel has been laid on 100 miles of completed grade, and will be laid a distance of 140 miles more before the close of 1911. Commercial telegraph service of G. T. P. Tel. Co. now in operation between Winnipeg and Edmonton, Alta., 792 miles. Branch lines contemplated aggregate 5,000 miles. The G. T. P. will operate Atlantic, Pacific and Lake fleets of steamers. A new daily passenger service was inaugurated between Winnipeg and Edmonton, in July, 1910, with standard sleeping cars, parlor-library, café car, and modern day coaches.

HUDSON BAY ROUTE.—From varied expert opinions, optimistic and the reverse, it may be fairly concluded that the route is open for navigation from about 15th July to about 15th October. The Canadian Northern Railway have built a line from Winnipeg to The Pas on the Saskatchewan River. From there to Fort Churchill the distance is 465 miles; to Port Nelson, 397 miles. This route will effect an average shortening of the distance from the Western wheat fields to the Atlantic seaboard of 970 miles. The distance to Liverpool from Churchill is 2,946 miles, from Montreal via Belle Isle 2,761, and via Cape Race, 2,927 miles. from New York 3,079 miles. The freight upon grain from the wheat belt to Hudson Bay would approximate 10 cents a bushel, a saving of 15 cents on carriage to the Atlantic seaboard, or $3,000,000 annually on an export trade of 20 million bushels via this route. On cattle shipments from Calgary there would be effected a saving in freight of 60 cents per 100 lbs., as well as a saving in deterioration. The entrance to the harbor at Fort Churchill is about 2,000 ft. wide, with a minimum depth of 10 fathoms. More dredging would have to be done at Port Nelson than Ft. Churchill, but reports of the Hudson's Bay Co., 1824 to 1894, show that on an average Ft. Churchill harbor is open 5 months, and Port Nelson 7 months in the year.

MILEAGE STEAM RAILWAYS IN OPERATION.—16 miles in 1836, date of first railway; 16 in 1846; 1,414 in 1856; 2,278 in 1866; 5,218 in 1876; 11,793 in 1886; 16,270 in 1896; 21,353 in 1906; 22,452 in 1907; 22,966 in 1908; 24,104 in 1909; 24,731 in 1910; 25,400 in 1911.

TRAFFIC STEAM RAILWAYS.—In 1875 there were carried 5,190,416 passengers and 5,670,837 tons of freight (2,000 lbs.). In 1885, 9,672,599 and 14,659,271; in 1895, 13,987,580 and 21,524,421; in 1906, 27,989,782 and 57,966,713; in 1907, 32,137,319 and 63,866,135; in 1908, 34,044,992 and 63,071,167; in 1909, 32,688,309 and 66,842,258; in 1910, 35,895,575 passengers and 74,482,866 tons of freight, and in 1911, 37,097,718 passengers and 79,884,282 tons of freight.

NATIONAL TRANSCONTINENTAL RAILWAY.—Under agreements dated 29th July 1903, and 18th February, 1904, ratified by Parliament the Grand Trunk Pacific Co. agreed in respect of the construction of a railway between Moncton, N. B., and Port Simpson, or some other port in B. C.—the eastern division, from Winnipeg to Moncton, to be constructed by the Dominion Government under four Commissioners, and leased for 50 years at a rental of 3 per cent. on cost of construction, the first 7 years to be free; the western division, from Winnipeg to Prince Rupert, B. C., to be constructed by the company. The Government to guarantee the company's bonds sufficient to meet cost of construction, such not to exceed $13,000 per mile on the prairie section. The entire line between Winnipeg and Moncton, 1,804.84 miles, is under contract. The work between Winnipeg and Moncton, N. B., is well under way, and the section between Winnipeg and Lake Superior Junction is open for operation. The total expenditure by the Commission up to 31st March, 1911, amounted to $95,406,697.61.

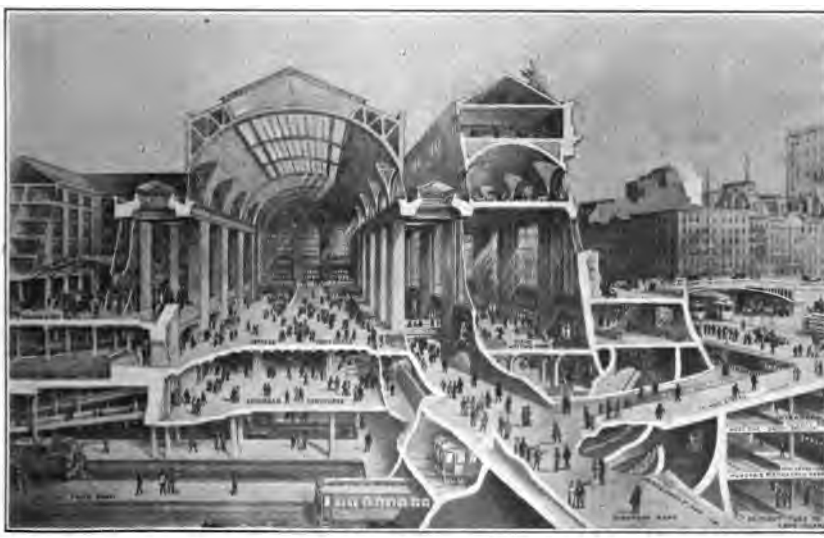
QUEBEC BRIDGE.—It is expected that the new bridge on the I. C. R. across the St. Lawrence River near Quebec will be ready for traffic in 1915. The contract has been let to the St. Lawrence Bridge Co., a Canadian concern. Total estimated cost, $12,000,000. The length of the central span is to be 1,800 ft., 90 ft. longer than the span of the Forth bridge, total length 3,228 ft., width 88 ft. The bridge will accommodate a double-track railway, and has a 4 ft. footpath on each side. This is the largest cantilever bridge in the world.

LONG RAILWAY TUNNELS.

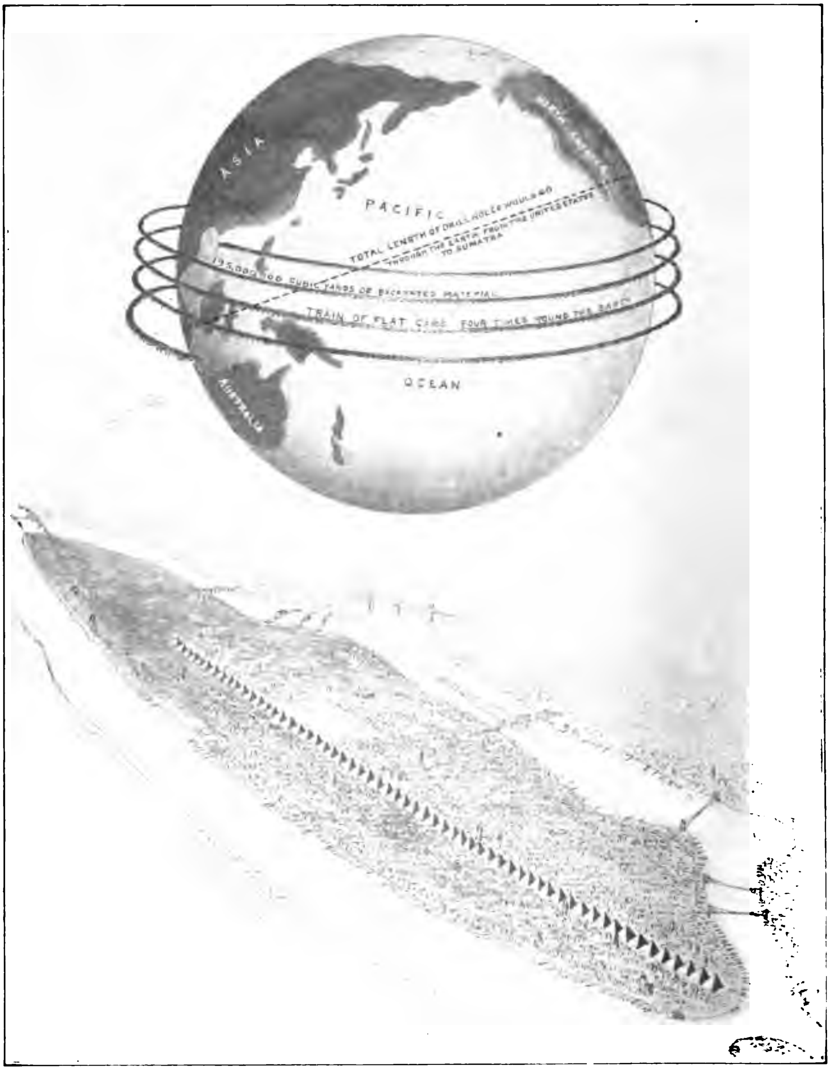
	Mls.	Yds.
Simplon, Switzerland-Italy	12	458
St. Gothard, Switzerland	9	564
Mont Cenis, Italy-France	7	1730
Arlberg, Austria	6	404
Hoosac, U. S. A.	4	1320
Severn, Great Western	4	624
Totley, Midland	3	950
Trans-Adine, Valparaiso-Buenos-Ayres	5	
Standedge, North Western	3	62
Woodhead, Great Central	3	17
Box, near Bath, Great Western (old)	1	1320

The Office of Public Roads estimates the total mileage of all public roads in the United States in 1909 at 2,199,388 and the miles of road per square mile of area at 0.74 miles. The population per mile of road, basing the road mileage of 1909 on the pooulation of 1910, was 41. Of all the roads in the United States only 8.66 per cent. were improved in 1909.

The total estimated expenditures for public roads for the year 1911 is $142,144,191, making a total of $64.63 per mile of public road and of $1.55 per inhabitant.



NEW GRAND CENTRAL TERMINAL, NEW YORK CITY.



COMPARISON SHOWING THE HUGE AMOUNT OF EXCAVATION FOR COMPLETED PANAMA CANAL.

The total of 195,000,000 cubic yards would build about 8 miles of Pyramids each of the size of Great Pyramid of Cheops. Loaded on flat cars it would represent a train 96,000 miles in length.

CHAPTER VIII.

THE PANAMA CANAL.

Compiled by the Secretary of the Isthmian Canal Commission.

The entire length of the Panama Canal from deep water in the Atlantic to deep water in the Pacific is about 50 miles. Its length from shore-line to shore-line is about 40 miles. In passing through it from the Atlantic to the Pacific, a vessel will enter the approach channel in Limon Bay, which will have a bottom width of 500 feet and extend to Gatun, a distance of about seven miles. At Gatun, it will enter a series of three locks in flight and be lifted 85 feet to the level of Gatun Lake. It may steam at full speed through this lake, in a channel varying from 1,000 to 500 feet in width, for a distance of about 24 miles, to Bas Obispo, where it will enter the Culebra Cut. It will pass through the Cut, a distance of about nine miles, in a channel with a bottom width of 300 feet, to Pedro Miguel. There it will enter a lock and be lowered 30⅓ feet to a small lake, at an elevation of 54⅔ feet above sea level, and will pass through this for about 1½ miles to Miraflores. There it will enter two locks in series and be lowered to sea level, passing out into the Pacific through a channel about 8½ miles in length, with a bottom width of 500 feet. The depth of the approach channel on the Atlantic side, where the maximum tidal oscillation is 2½ feet, will be 41 feet at mean tide, and on the Pacific side, where the maximum oscillation is 21 feet, the depth will be 45 feet at mean tide.

Throughout the first 16 miles from Gatun, the width of the Lake channel will be 1,000 feet; then for 4 miles it will be 800 feet, and for 4 miles more to the northern entrance of Culbra Cut at Bas Obispo, it will be 500 feet. The depth will vary from 85 to 45 feet. The water level in the Cut will be that of the Lake, the depth 45 feet, and the bottom width of the channel 300 feet.

Three hundred feet is the minimum bottom width of the Canal. This width begins about half a mile above Pedro Miguel locks and extends about 8 miles through Culebra Cut, with the exception that at all angles the channel is widened sufficiently to allow a thousand-foot vessel to make the turn. The Cut has eight angles, or about one to every mile. The 300-foot widths are only on tangents between the turning basins at the angles. The smallest of these angles is 7° 36′ and the largest 30°.

In the whole Canal there are 22 angles, the total curvature being 600° 51′. Of this curvature, 281° 10′ are measured to the right, going south, and 319° 41′ to the left. The sharpest curve occurs at Tabernilla, and is 67° 10′.

GATUN DAM.

The Gatun Dam, which will form Gatun Lake by impounding the waters of the Chagres and its tributaries, will be nearly 1½ miles long, measured on its crest, nearly ½ mile wide at its base, about 400 feet wide at the water surface, about 100 feet wide at the top, and its crest as planned, will be at an elevation of 115 feet above mean sea level, or 30 feet above the normal level of the Lake. Of the total length of the Dam only 500 feet, or 1/15, will be exposed to the maximum water head of 85 feet. The interior of the Dam will be formed of a natural mixture of sand and clay, dredged by hydraulic process from pits above and below the Dam, and placed between two large masses of rock and miscellaneous material obtained from steam shovel excavation at various points along the Canal. The top and upstream slope will be thoroughly riprapped. The entire Dam will contain about 21,000,000 cubic yards of material.

The Spillway is a concrete lined opening, 1,200 feet long and 300 feet wide, cut through a hill of rock nearly in the center of the Dam, the bottom of the opening being 10 feet above sea level. It will contain about 225,000 cubic yards of concrete. During the construction of the Dam, all the water discharged from the Chagres and its tributaries flowed through this opening. Construction has now advanced sufficiently to permit the Lake to be formed, and the Spillway has been closed with a concrete dam, which is being fitted with gates and machinery for regulating the water level of the Lake.

WATER SUPPLY OF GATUN LAKE.

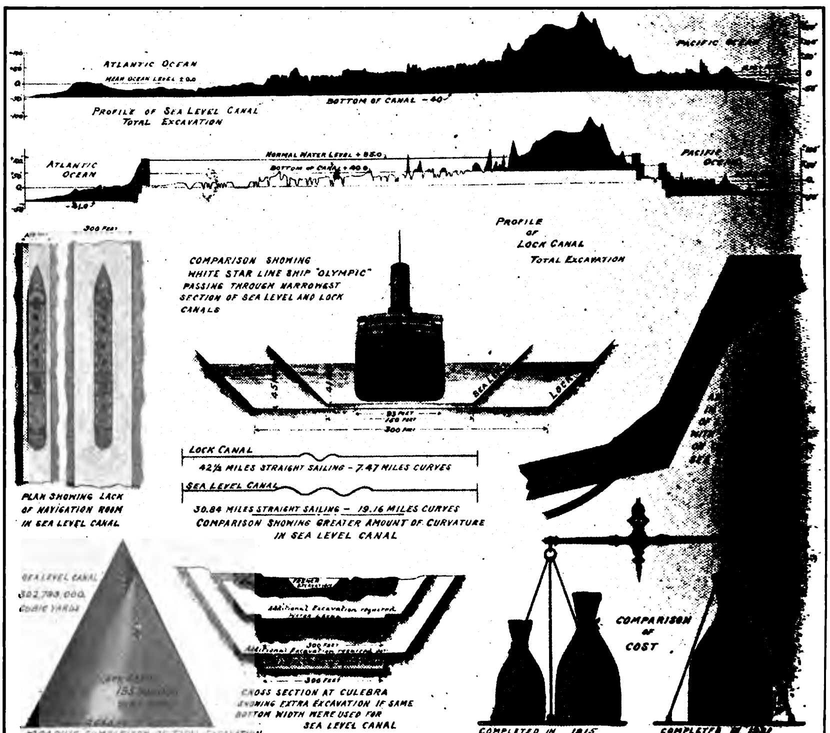
Gatun Lake will impound the waters of a basin comprising 1,320 square miles. When the surface of the water is at 85 feet above sea level, the Lake will have an area of about 164 square miles, and will contain about 206 billion cubic feet of water. During eight or nine months of the year, the lake will be kept constantly full by the prevailing rains, and consequently a surplus will need to be stored for only three or four months of the dry season. The smallest run-off of water in the basin, during the past 21 years, as measured at Gatun, was about 146 billion cubic feet. In 1910 the run-off was 360 billion cubic feet, or a sufficient quantity to fill the lake one and a half times. The water surface of the Lake will be maintained during the rainy season at 87 feet above sea level, making the minimum channel depth in the Canal 47 feet. As navigation can be carried on with about 41 feet of water, there will be stored for dry

season surplus over five feet of water. Making due allowance for evaporation, seepage, leakage at the gates, and power consumption, this would be ample for 41 passages daily through the locks, using them at full length, or about 58 lockages a day when partial length is used, as would usually be the case, and when cross filling from one lock to the other through the central wall is employed. This would be a larger number of lockages than would be possible in a single day. The average number of lockages through the Sault Ste. Marie Canal on the American side was 39 per day in the season of navigation of 1910, which was about eight months long. The average number of ships passed was about 1½ per lockage. The freight carried was more than 26,000,000 tons. The Suez Canal passed about 12 vessels per day, with a total tonnage for the year of 16,582,000.

DAMS ON PACIFIC SIDE.

The water level of Gatun Lake, extending through the Culebra Cut, will be maintained at the south end by an earth dam connecting the locks at Pedro Miguel with the high ground to the westward, about 1,400 feet long, with its crest at an elevation of 105 feet above mean tide. A concrete core wall, containing about 700 cubic yards, will connect the locks with the hills to the eastward; this core wall will rest directly on the rock surface and is designed to prevent percolation through the earth, the surface of which is above the Lake level.

A small lake between the locks at Pedro Miguel and Miraflores will be formed by dams connecting the walls of Miraflores locks with the high ground on either side. The dam to the westward will be of earth, about 2,700 feet long, having its crest about 15 feet above the water in Miraflores Lake. The east dam will be of concrete, containing about 75,000 cubic yards; will be about 500 feet long, and will form a spillway for Miraflores Lake, with crest gates similar to those at the Spillway of the Gatun Dam.



DIAGRAMMATIC COMPARISON SHOWING SUPERIORITY OF LOCK CANAL TO ONE AT SEA LEVEL.

THE LOCKS.

There will be 6 double locks in the Canal; three pairs in flight at Gatun, with a combined lift of 85 feet; one pair at Pedro Miguel, with a lift of 30⅓ feet, and two pairs at Miraflores, with a combined lift of 54⅔ feet at mean tide. The usable dimensions of all are the same—a length of 1,000 feet, and width of 110 feet. Each lock will be a chamber, with walls and floor of concrete, and mitering gates at each end.

The side walls will be 45 to 50 feet wide at the surface of the floor; will be perpendicular on the face, and will narrow from a point 24⅓ feet above the floor until they are 8 feet wide at the top. The middle wall will be 60 feet wide, approximately 81 feet high, and each face will be vertical. At a point 42⅓ feet above the surface of the floor, and 15 feet above the top of the middle culvert, this wall will divide into two parts, leaving a space down the center much like the letter "U," which will be 19 feet wide at the bottom and 44 feet wide at the top. In this center space will be a tunnel divided into three stories, or galleries. The lowest gallery will be for drainage; the middle, for the wires that will carry the electric current to operate the gate and valve machinery installed in the center wall, and the upper will be a passageway for the operators.

The lock gates will be steel structures 7 feet thick, 65 feet long, and from 47 to 82 feet high. They will weigh from 390 to 730 tons each. Ninety-two leaves will be required for the entire Canal, the total weighing 60,000 tons. Intermediate gates will be used in the locks, in order to save water and time, if desired, in locking small vessels through, the gates being so placed as to divide the locks into chambers 600 and 400 feet long, respectively. Ninety-five per cent. of the vessels navigating the high seas are less than 600 feet long. In the construction of the locks, which are now practically completed, it is estimated that there has been used approximately 4,200,000 cubic yards of concrete, requiring about the same number of barrels of cement.

Electricity will be used to tow all vessels into and through the locks, and to operate all gates and valves, power being generated by water turbines from the head created by Gatun Lake. Vessels will not be permitted to enter or pass through the locks under their own power, but will be towed through by electric locomotives running on cog-rails laid on the tops of the lock walls. There will be two towing tracks for each flight of locks, one on the side and one on the middle wall. On each side wall there will be one return track and on the middle wall a third common to both of the twin locks. All tracks will run continuously the entire length of the respective flights and will extend some distance on the guide approach walls at each end. The number of locomotives used will vary with

LOOKING THROUGH ONE OF THE GATUN LOCKS.
Width, 110 feet; length of one chamber, 1000 feet.

LOCK GATES AT GATUN LOCKS.
7 feet thick and 76 feet high.

the size of the vessel. The usual number required will be four; two ahead, one on each wall, imparting motion to the vessel, and two astern, one on each wall, to aid in keeping the vessel in a central position and to bring it to rest when entirely within the lock chamber. They will be equipped with a slip drum, towing windlass and hawser which will permit the towing line to be taken in or paid out without actual motion of the locomotive on the track.

The locks will be filled and emptied through a system of culverts. One culvert 254 sq. ft. in area of cross section, about the area of the Hudson River tunnels of the Pennsylvania Railroad, extends the entire length of each of the middle and side walls and from each of these large culverts there are several smaller culverts, 33 to 44 sq. ft. in area, which extend under the floor of the lock and communicate with the lock chamber through holes in the floor. The large culverts are controlled at points near the miter gates by large valves and each of the small culverts extending from the middle wall culvert into the twin chambers is controlled by a cylindrical valve. The large culvert in the middle wall feeds in both directions through laterals, thus permitting the passage of water from one twin lock to another, effecting a saving of water.

To fill a lock the valves at the upper end are opened and the lower valves closed. The water flows from the upper pool through the large culverts into the small lateral culverts and thence through the holes in the floor into the lock chamber. To empty a lock the valves at the upper end are closed and those at the lower end are opened and the water flows into the lower lock or pool in a similar manner. This system distributes the water as evenly as possible over the entire horizontal area of the lock and reduces the disturbance in the chamber when it is being filled or emptied.

The depth of water over the miter sills of the locks will be 40 feet in salt water and 41⅓ feet in fresh water.

The average time of filling and emptying a lock will be about fifteen minutes, without opening the valves so suddenly as to create disturbing currents in the locks or approaches. The time required to pass a vessel through all the locks is estimated at 3 hours; one hour and a half in the three locks at Gatun, and about the same time in the three locks on the Pacific side. The time of passage of a vessel through the entire Canal is estimated as ranging from 10 to 12 hours, according to the size of the ship, and the rate of speed at which it can travel.

EXCAVATION.

The total excavation, dry and wet, for the Canal, as originally planned, was estimated at 103,795,000 cubic yards, in addition to the excavation by the French companies. Changes in the plan of the Canal, made subsequently by order of the President, increased the amount to 174,666,594 cubic yards. Of this amount, 89,794,493 cubic yards were to be taken from the Central Division, which includes the Culebra Cut. In July, 1910, a further increase of 7,871,172 cubic yards was made, of which 7,330,525 cubic yards were to allow for slides in Culebra Cut, for silting in the Chagres section, and for lowering the bottom of the Canal from 40 to 39 feet above sea level in the Chagres section. These additions increased the estimated total excavation to 182,537,766 cubic yards. In 1911, a further increase of 12,785,613 cubic yards was made, of which 5,257,281 cubic yards were for slides in Culebra Cut, and the remainder for additional excavation and silting in the Atlantic and Pacific entrances, raising the grand total of estimated excavation to 195,323,379 cubic yards. In 1912 a still further increase of 17,180,621 cubic yards was made, of which 3,450,000 cubic yards was for slides in Culebra Cut and the remainder for dredging excavation at Gatun locks, silting in the Atlantic entrance, and for the Balboa terminals, bringing the grand total of estimated excavation to 212,504,000 cubic yards. Records of all excavation to May 1, 1911, are appended:

By French Companies		78,146,960
French excavation useful to present Canal		29,908,000
By Americans—		
Dry excavation	116,428,685	
Dredges	50,976,485	
		188,280,312
May 4 to December 31, 1904	243,472	
January 1 to December 31, 1905	1,799,227	
January 1 to December 31, 1906	4,948,497	
January 1 to December 31, 1907	15,765,290	
January 1 to December 31, 1908	37,116,735	
January 1 to December 31, 1909	35,096,166	
January 1 to December 31, 1910	31,437,677	
January 1 to December 31, 1911	31,603,899	
January 1 to December 31, 1912	30,269,349	

SLIDES AND BREAKS

There have been in all 26 slides and breaks in Culebra Cut; 17 covered areas varying from 1 to 75 acres and 9 covered areas of less than 1 acre each, making in all a total of 225 acres. One variety of slide is caused by the slipping of the top layer of clay and earth on a smooth sloping surface of a harder material. The largest slide of this character is that known as Cucaracha on the east bank of the Canal just south of Gold Hill. This gave the French company trouble during the final years of its operation. It first gave the Americans trouble in 1905, and between that date and July 1, 1912, nearly 3,000,000 cubic yards of material were removed from the Canal because of it. It broke nearly 1,900 feet back from the axis of the Canal and covers an area of 47 acres. Another variety of slide, properly called break, is due to the steepness of the slopes and the great pressure of the superincumbent material upon the underlying layers of softer material. The largest slide or break of this kind is on the west side of the cut at Culebra just north of Contractor's Hill, and covers an area of 75 acres. Over 7,000,000 cubic yards of material have been removed from this slide, and it is

Courtesy of "The Sphere."

WHERE CANAL MEETS ATLANTIC.

Limon Bay is on the right, through which the extended canal entrance leads to the Atlantic Ocean on the left.

thought that by the time the Canal shall have been completed something like 10,000,000 cubic yards will have been taken out. On the east side of the cut a similar slide covers an area of 50 acres, breaking back about 1,300 feet from the center of the Canal. About a half million cubic yards have been taken out of this slide, and more remains to be removed. It is estimated that the total amount of material removed from the Canal because of the slides will aggregate between 21,000,000 and 22,000,000 cubic yards.

CAPACITY OF STEAM SHOVELS AND DIRT TRAINS.

There are several classes of steam shovels engaged in excavating work, equipped with dippers ranging in capacity from 1¾ cubic yards to 5 cubic yards, and a trenching shovel, which has a dipper with a capacity of ¾ of a cubic yard.

Each cubic yard, place measurement, of average rock weighs about 3,900 pounds; of earth, about 3,000 pounds; of "the run of the cut," about 3,600 pounds, and is said to represent about a two-horse cart load. Consequently, a five cubic yard dipper, when full, carries 8.7 tons of rock, 6.7 tons of earth, and 8.03 tons of "the run of the cut."

Three classes of cars are used in hauling spoil—flat cars with one high side, which are unloaded by plows operated by a cable upon a winding drum, and two kinds of dump cars, one large and one small. The capacity of the flat cars is 19 cubic yards; that of the large dump cars, 17 cubic yards, and that of the small dump cars, 10 cubic yards. The flat car train is ordinarily composed of 20 cars in hauling from the cut at Pedro Miguel, and of 21 cars in hauling from the cut at Matachin. The large dump train is composed of 27 cars, and the small dump train of 35 cars.

The average load of a train of flat cars, in hauling the mixed material known as "the run of the cut," is 610.7 tons (based on a 20-car train); of a train of large dump cars, 737.68 tons, and of a train of small dumps, 562.5 tons.

The average time consumed in unloading a train of flat cars is from 7 to 15 minutes; in unloading a train of large dump cars, 15 to 40 minutes; and in unloading a train of small dump cars, 6 to 56 minutes. The large dump cars are operated by compressed air power furnished by the air pump of the locomotive, while the small dump cars are operated by hand.

The record day's work for one steam shovel was that of March 22, 1910, 4,823 cubic yards of rock (place measurement), or 8,395 tons. The highest daily record in the Central Division was on March 11, 1911, when 51 steam shovels and 2 cranes equipped with orange peel buckets excavated an aggregate of 79,484 cubic yards, or 127,742 tons. During this day, 333 loaded trains and as many empty trains were run to and from the dumping grounds.

BREAKWATERS.

Breakwaters are under construction at the Atlantic and Pacific entrances of the Canal. That in Limon Bay, or Colon harbor, extends into the bay from Toro Point at an angle of 42 degrees and 53 minutes northward from a base line drawn from Toro Point to Colon light, and will be 10,500 feet in length, or 11,700 feet, including the shore connection, with a width at the top of fifteen feet and a height above mean sea level of ten feet. The width at the bottom will depend largely on the depth of water. It will contain approximately 2,840,000 cubic yards of rock, the core being formed of rock quarried on the mainland near Toro Point, armored with hard rock from Porto Bello. Work began on the breakwater in August, 1910, and on Dec. 1, 1912, the trestle and fill were completed to full length, 11,500 feet. On the same date, about one-seventh, or 1,643 feet of the rock armour had been placed. The estimated cost is $5,500,000. A second breakwater has been proposed for Limon Bay, but this part of the project has not been formally acted upon. The purpose of the breakwaters is to convert Limon Bay into a safe anchorage, to protect shipping in the harbor of Colon, and vessels

the size of the vessel. The usual number required will be four; two ahead, one on each wall, imparting motion to the vessel, and two astern, one on each wall, to aid in keeping the vessel in a central position and to bring it to rest when entirely within the lock chamber. They will be equipped with a slip drum, towing windlass and hawser which will permit the towing line to be taken in or paid out without actual motion of the locomotive on the track.

The locks will be filled and emptied through a system of culverts. One culvert 254 sq. ft. in area of cross section, about the area of the Hudson River tunnels of the Pennsylvania Railroad, extends the entire length of each of the middle and side walls and from each of these large culverts there are several smaller culverts, 33 to 44 sq. ft. in area, which extend under the floor of the lock and communicate with the lock chamber through holes in the floor. The large culverts are controlled at points near the miter gates by large valves and each of the small culverts extending from the middle wall culvert into the twin chambers is controlled by a cylindrical valve. The large culvert in the middle wall feeds in both directions through laterals, thus permitting the passage of water from one twin lock to another, effecting a saving of water.

To fill a lock the valves at the upper end are opened and the lower valves closed. The water flows from the upper pool through the large culverts into the small lateral culverts and thence through the holes in the floor into the lock chamber. To empty a lock the valves at the upper end are closed and those at the lower end are opened and the water flows into the lower lock or pool in a similar manner. This system distributes the water as evenly as possible over the entire horizontal area of the lock and reduces the disturbance in the chamber when it is being filled or emptied.

The depth of water over the miter sills of the locks will be 40 feet in salt water and 41 1/3 feet in fresh water.

The average time of filling and emptying a lock will be about fifteen minutes, without opening the valves so suddenly as to create disturbing currents in the locks or approaches. The time required to pass a vessel through all the locks is estimated at 3 hours; one hour and a half in the three locks at Gatun, and about the same time in the three locks on the Pacific side. The time of passage of a vessel through the entire Canal is estimated as ranging from 10 to 12 hours, according to the size of the ship, and the rate of speed at which it can travel.

EXCAVATION.

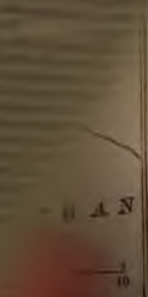
The total excavation, dry and wet, for the Canal, as originally planned, was estimated at 103,795,000 cubic yards, in addition to the excavation by the French companies. Changes in the plan of the Canal, made subsequently by order of the President, increased the amount to 174,666,594 cubic yards. Of this amount, 89,794,493 cubic yards were to be taken from the Central Division, which includes the Culebra Cut. In July, 1910, a further increase of 7,871,172 cubic yards was made, of which 7,330,525 cubic yards were to allow for slides in Culebra Cut, for silting in the Chagres section, and for lowering the bottom of the Canal from 40 to 39 feet above sea level in the Chagres section. These additions increased the estimated total excavation to 182,537,766 cubic yards. In 1911, a further increase of 12,785,613 cubic yards was made, of which 5,257,281 cubic yards were for slides in Culebra Cut, and the remainder for additional excavation and silting in the Atlantic and Pacific entrances, raising the grand total of estimated excavation to 195,323,379 cubic yards. In 1912 a still further increase of 17,180,621 cubic yards was made, of which 3,450,000 cubic yards was for slides in Culebra Cut and the remainder for silting dredging excavation at Gatun locks, in the Atlantic entrance, and for the Balboa terminals, bringing the grand total of estimated excavation to 212,504,000 cubic yards. Records of all excavation to May 1, 1911, a[illegible] appended:

By French Companies	78,[illegible]
French excavation useful to present Canal	29[illegible]
By Americans—	
Dry excavation	116,428,685
Dredges	50,976,485
May 4 to December 31, 1904	243,4[illegible]
January 1 to December 31, 1905	1,79[illegible]
January 1 to December 31, 1906	4,94[illegible]
January 1 to December 31, 1907	15[illegible]
January 1 to December 31, 1908	37[illegible]
January 1 to December 31, 1909	[illegible]
January 1 to December 31, 1910	[illegible]
January 1 to December 31, 1911	[illegible]
January 1 to December 31, 1912	[illegible]

SLIDES AND BREAKS

There have been in all 26 slides and breaks in Culebra Cut; 17 covered areas varying from 1 to 75 acres and 9 covered areas of less than 1 acre each, making in all a total of 225 acres. One variety of slide is caused by the slipping of the top layer of clay and earth on a smooth sloping surface of a harder material. The largest slide of this character is that known as Cucaracha on the east bank of the Canal just south of Gold Hill. This gave the French company trouble during the final years of its operation. It first gave the Americans trouble in 1905, and between that date and July 1, [illegible] yards of materi[illegible] Canal becau[illegible] feet back f[illegible] covers an a[illegible] of slide, pro[illegible] steepness of [illegible] of th[illegible] underly[illegible] largest [illegible] west [illegible] Contr[illegible] ac[illegible] h[illegible]

Courtesy of "The ...



making the north entrance to the Canal, from the violent northers that are likely to prevail from October to January, and to reduce to a minimum the amount of silt that may be washed into the dredged channel.

The breakwater at the Pacific entrance will extend from Balboa to Naos Island, a distance of about 17,000 feet, or a little more than three miles. It will lie from 900 to 2,700 feet east of and for the greater part of the distance nearly parallel to the axis of the Canal prism; will vary from 20 to 40 feet in height above mean sea level, and will be from 50 to 3,000 feet wide at the top. It is estimated that it will contain about 18,000,000 cubic yards of earth and rock, all of which will be brought from Culebra Cut. It is constructed for a two-fold purpose; first, to divert cross currents that would carry soft material from the shallow harbor of Panama into the Canal channel; second, to insure a more quiet harbor at Balboa. Work was begun on it in May, 1908, and on November 6, 1912, the last piles were driven connecting Naos Island with the mainland. On the same date about one-half mile of trestle remained to be filled.

CANAL FORCE, QUARTERS AND SUPPLIES.

The Canal force is recruited and housed by the Quartermaster's Department which has two general branches, labor and quarters, and material and supplies. Through the labor and quarters branch there have been brought to the Isthmus 44,394 laborers, of whom 11,797 came from Europe, 19,448 from Barbados, the balance from other islands in the West Indies and from Colombia. No recruiting is required at present, the supply of labor on the Isthmus being ample.

On December 1, 1912, the total force of the Isthmian Canal Commission and Panama Railroad Company, actually at work, was divided as follows:

	Gold	Silver	Total
Isthmian Canal Commission	4,475	26,199	30,594
Panama Railroad Company	630	4,256	4,886
Panama Railroad Commissary	257	923	1,180
Totals	5,362	31,298	36,660

In addition to the above there were in the employ of contractors on the Isthmus, 454 gold and 3,045 silver employees, a total of 3,499.

The gold force is made up of the officials, clerical force, construction men, and skilled artisans of the Isthmian Canal Commission and the Panama Railroad Company. Practically all of them are Americans. The silver force represents the unskilled laborers of the Commission and the Panama Railroad Company. Of these, about 4,500 are Europeans, mainly Spaniards, with a few Italians and other races. The remainder, about 25,000, are West Indians, about 5,000 of whom are employed as artisans receiving 16, 20, and 25 cents, and a small number, 32 and 44 cents, an hour, and 7,000 on a monthly basis. The standard rate of the West Indian laborer is 10 cents an hour, but a few of these doing work of an exceptional character are paid 16 and 20 cents. The larger part of the Spaniards are paid 20 cents an hour, and the rest 16 cents an hour.

The material and supply branch carries in eight general storehouses a stock of supplies for the Commission and Panama Railroad valued approximately at $4,500,000. About $12,000,000 worth of supplies are purchased annually, requiring the discharge of one steamer each day.

FOOD, CLOTHING AND OTHER NECESSARIES.

The Canal and Panama Railroad forces are supplied with food, clothing and other necessaries through the Subsistence Department, which is divided into two branches—Commissary and Hotel. It does a business of about seven million five hundred thousand dollars per annum. The business done by the Commissary Department amounts to about $6,000,000 per annum, and that done by the hotel branch to about $1,500,000 per annum.

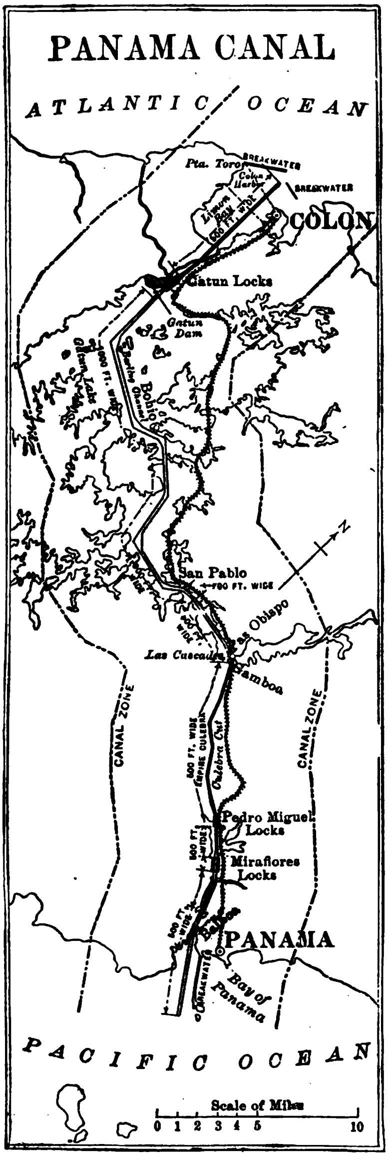
The Commissary system consists of 22 general stores in as many Canal Zone villages and camps along the relocated line of the Panama Railroad. It is estimated that with employees and their dependents, there are about 65,000 people supplied daily with food, clothing, and other necessaries. In addition to the retail stores, the following plants are operated at Cristobal: cold storage, ice making, bakery, coffee roasting, ice cream, laundry and packing department.

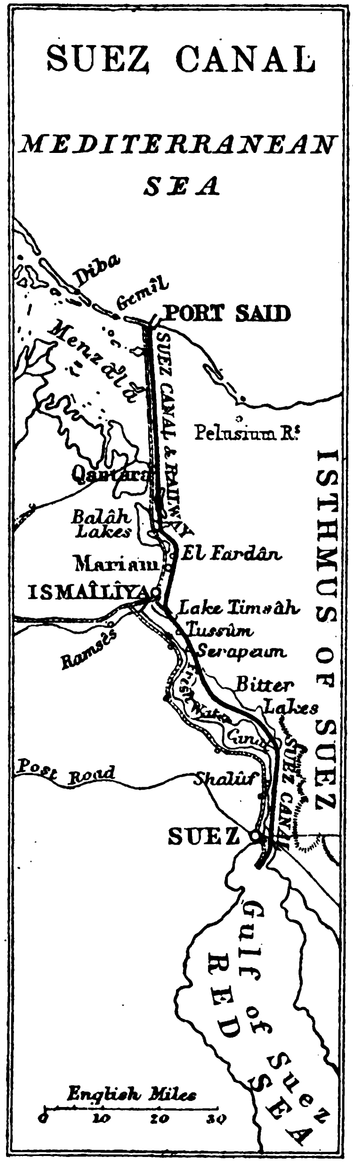
A supply train of 21 cars leaves Cristobal every morning at 4 a. m. It is composed of refrigerator cars containing ice, meats and other perishable articles, and ten containing other supplies. These are delivered at the stations along the line and distributed to the houses of employees by the Quartermaster's Department.

The hotel branch maintains the Hotel Tivoli at Ancon, and also 18 hotels along the line for white gold employees at which meals are served for thirty cents each. At these 18 hotels there are served monthly about 200,000 meals. There are seventeen messes for European laborers, who pay 40 cents per ration of three meals. There are served at these messes about 200,000 meals per month. There are also operated for the West Indian laborers sixteen kitchens, at which they are served a ration of three meals for 27 cents per ration. There are about 100,000 meals served monthly at these kitchens. The supplies for one month for the line hotels, messes and kitchens cost about $85,000; labor and other expenses about $16,500. The monthly receipts, exclusive of the revenue from the Hotel Tivoli, amount to about $105,000.

VALUE OF THE $40,000,000 FRENCH PURCHASE.

Excavation, useful to the Canal, 29,708,000 cubic yards	$25,389,240.00
Panama Railroad Stock	9,644,320.00
Plant and material, used and sold for scrap	2,112,063.00
Buildings, used	2,054,203.00
Surveys, plans, maps and records	2,000,000.00
Land	1,000,000.00
Clearings, roads, etc.	100,000.00
Ship channel in Panama Bay, four years' use	500,000.00
Total	$42,799,826.00


PANAMA CANAL
ATLANTIC OCEAN
Pta. Toro
BREAKWATER
Colon Harbor
BREAKWATER
Limon Bay
COLON
Gatun Locks
Gatun Dam
Gatun Lake
Bohio
San Pablo
700 FT. WIDE
Las Cascadas
Gamboa
CANAL ZONE
CANAL ZONE
Culebra Cut
Pedro Miguel Locks
Miraflores Locks
PANAMA
Bay of Panama
PACIFIC OCEAN
Scale of Miles
0 1 2 3 4 5 10


SUEZ CANAL
MEDITERRANEAN SEA
Diba
Gemil
PORT SAID
Menzaleh
SUEZ CANAL & RAILWAY
Pelusium R.
Qantara
Balâh Lakes
El Fardân
Mariam
ISMAÎLÎYA
Lake Timsâh
Tussûm
Serapeum
Ramsês
Bitter Lakes
Post Road
Shalûf
SUEZ
ISTHMUS OF SUEZ
Gulf of Suez
RED SEA
English Miles
0 10 20 30

THE CANAL ZONE.

The Canal Zone contains about 436 square miles. It begins at a point three marine miles from mean low water mark in each ocean, and extends for five miles on each side of the center line of the route of the Canal. It includes the group of islands in the Bay of Panama named Perico, Naos, Culebra, and Flamenco. The cities of Panama and Colon are excluded from the Zone, but the United States has the right to enforce sanitary ordinances in those cities, and to maintain public order in them in case the Republic of Panama should not be able, in the judgment of the United States, to do so.

Of the 436 square miles of Zone territory, the United States owns about 363, and 73 are held in private ownership. Under the treaty with Panama, the United States has the right to acquire by purchase, or by the exercise of the right of eminent domain, any lands, buildings, water rights, or other properties necessary and convenient for the construction, maintenance, operation, sanitation, and protection of the Canal, and it can, therefore, at any time acquire the lands within the Zone boundaries which are owned by private persons.

RELOCATED PANAMA RAILROAD.

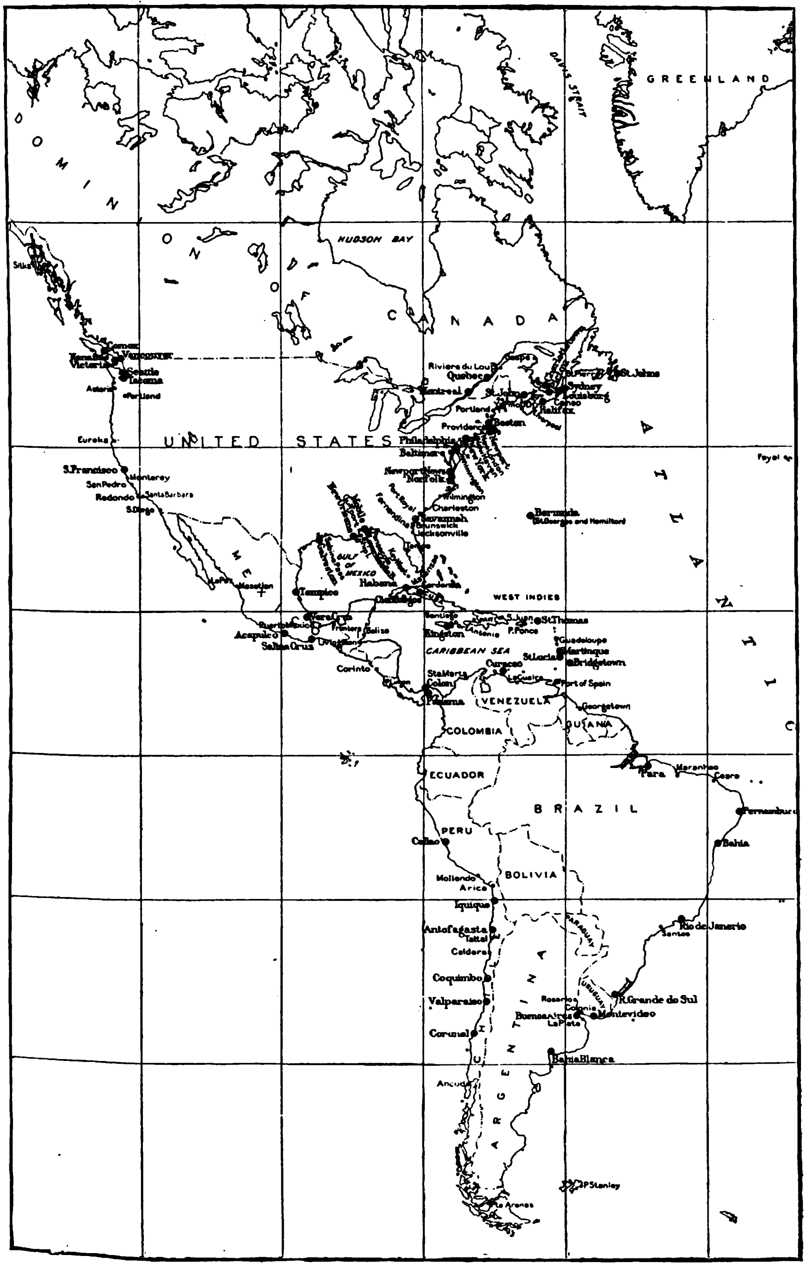
The new, or relocated line of the Panama Railroad is 47.1 miles long, or 739 feet longer than the old line. From Colon to Mindi, 4.17 miles, and from Corozal to Panama, 2.83 miles, the old location is used, but the remaining 40 miles are new road. From Mindi to Gatun the railroad runs, in general, parallel to the Canal, and ascends from a few feet above tide water elevation to nearly 95 feet above. At Gatun the road leaves the vicinity of the Canal and turns east along Gatun Ridge to a point about 4½ miles from the center line of the Canal, where it turns southward again and crosses the low Gatun Valley to Monte Lirio, from which point it skirts the east shore of Gatun Lake to the beginning of Culebra Cut, at Bas Obispo. In this section there are several large fills, occurring where the line crosses the Gatun Valley and near the north end of Culebra Cut, where the line was located so as to furnish waste dumps for the dirt from the Canal. Originally it was intended to carry the railroad through Culebra Cut on a 40-foot berm, 10 feet above the water level, but the numerous slides have made this plan impracticable and a line is now being constructed around the Cut, known locally as the Gold Hill Line. Leaving the berm of the Canal at Bas Obispo, the Gold Hill Line gradually works into the foot hills, reaching a distance from the center line of the Canal of two miles opposite Culebra; thence it runs down the Pedro Miguel Valley to Paraiso, where it is only 800 feet from the center line of the Canal. This section of the line is located on maximum grade of 1.25 per cent. compensated, and has a total length of 9⅜ miles. The sharpest curve on the whole line is 7°. From the south end of Culebra Cut to Paraiso, the railroad runs practically parallel with the Canal to Panama, with maximum grade of 0.45 per cent. Where the railroad crosses the Gatun River, a bascule steel bridge is to be erected, and a steel girder bridge, ¼ mile long, with 200-foot through truss channel span, is in use across the Chagres River at Gamboa. Small streams are crossed on reinforced concrete culverts. Near Miraflores, a tunnel 736 feet long has been built through a hill. Total cost of new line has been $8,866,392.02.

THE EQUIPMENT FOR THE CONSTRUCTION OF THE CANAL.

The Equipment consists of the latest and most efficient appliances, the quality of which has been demonstrated by the remarkable totals of excavation which have been recorded during the progress of the work. It includes 100 steam shovels, most of which are of from 70 to 105 tons weight and 3 to 5 cubic yards bucket capacity; 161 American locomotives of from 106 to 117 tons weight; 104 small French locomotives of 20 to 30 tons; 42 narrow gauge and electric locomotives; 553 drills; 4,572 cars; 79 spreaders, track-shifters, unloaders, etc., 20 dredges; 47 cranes; 11 tugs; 72 barges, scows, etc. and 24 launches. The Panama Railroad has 62 locomotives; 57 coaches and 1,434 freight cars.

CANAL STATISTICS

Length from deep water to deep water (miles)	50
Length from shore-line to shore-line (miles)	40
Bottom width of channel, maximum (feet)	1,000
Bottom width of channel, minimum, 9 miles, Culebra Cut (ft.)	300
Locks, in pairs	12
Locks, usable length (feet)	1,000
Locks, usable width (feet)	110
Gatun Lake, area (square miles)	164
Gatun Lake, channel depth (feet)	85 to 45
Culebra Cut, channel depth (ft.)	45
Excavation, Canal Proper, estimated total (cubic yards)	203,710,000
Excavation, permanent structures, estimated (cubic yards)	8,794,000
Excavation, grand total, estimated (cubic yards)	212,504,000
Excavation, due to slides and breaks, estimated (cubic yards), about	22,000,000
Excavation accomplished January 1, 1913 (cubic yards)	188,280,312
Excavation, remaining, Canal Proper, January 1, 1913 (cubic yards)	23,426,713
Excavation by the French, (cubic yards)	78,146,960
Excavation by French, useful to present Canal (cubic yards)	29,908,000
Excavation by French, estimated value to Canal	$25,389,240
Value of all French property	$42,799,826
Concrete, total estamated for Canal (cubic yards)	5,000,000
Time of transit through completed Canal (hours)	10 to 12
Time of passage through locks (hours)	3
Relocated Panama Railroad, total cost	$8,866,392
Relocated Panama Railroad, length (miles)	47.1
Canal Zone, area (square miles)	436
Canal and Panama Railroad force actually at work (about)	36,000
Canal and Panama Railroad force, Americans (about)	5,000
Cost of Canal, estimated total	$375,000,000
Work begun by Americans	May 4, 1904
Date of completion	Jan. 1, 1915



COALING STATIONS OF NORTH AND SOUTH AMERICA.

DISTANCES FROM NEW YORK, NEW ORLEANS, SAN FRANCISCO, AND PORT TOWNSEND TO THE PRINCIPAL PORTS OF THE WORLD AND THE PRINCIPAL CITIES OF THE UNITED STATES.

[Sources: Water routes in nautical miles, Hydrographic Office, Navy Department; land routes in statute miles, War Department.]

FOREIGN CITIES.[1]

Port and route.	New York.	New Orleans.	San Francisco.	Port Townsend.
Aden:				
Via Suez Canal	6,532	7,870		
Via Cape of Good Hope	10,985	11,408		
Via Suez Canal and New York			[2]9,723	[2]9,731
Via Cape of Good Hope and New York			[2]14,176	[2]14,184
Via Suez and Tehuantepec			9,500	10,300
Via Suez and Panama			10,800	11,600
Via Suez and Magellan Strait			15,900	16,700
Via Singapore			11,500	11,300
Via Singapore and Port Townsend	[2]14,499	[2]14.279		
Via Singapore and San Francisco	[2]14,691	[2]13,982		
Antwerp	3,325	4,853		
Via New York			[2]6,516	[2]6,524
Via Tehuantepec			7,554	8,329
Via Panama			8,264	9,039
Via Magellan Strait			13,671	14,446
Batavia (Java)			7,800	7,600
Via Tehuantepec	12,323	11,075		
Via Panama	13,167	12,566		
Via Suez Canal	10,182	11,598		
Via Cape of Good Hope	11,855	12,278		
Bombay:				
Via Suez Canal	8,120	9,536		
Via Cape of Good Hope	11,250	11,848		
Via Suez and New York			[2]11,311	[2]11,319
Via Cape of Good Hope and New York			[2]14,441	[2]14,449
Via Suez and Tehuantepec			12,110	12,885
Via Suez and Panama			12,512	13,287
Via Cape of Good Hope and Tehuantepec			15,108	15,800
Via Cape of Good Hope and Panama			14,500	15,270
Via Magellan Strait			15,064	15,639
Via Singapore			9,780	9,580
Via Singapore and Port Townsend	[2]12,771	[2]12,559		
Via Singapore and San Francisco	[2]12,971	[2]12,262		
Via Singapore and Tehuantepec	13,993	12,745		
Via Singapore and Panama	14,837	14,236		

Port and route.	New York.	New Orleans.	San Francisco.	Port Townsend.
Hamburg	3,652	5,243		
Via New York			[2]6,843	[2]6,851
Habana	1,227	597		
Via New Orleans			[2]3,079	[2]4,006
Via Tehuantepec			3,219	3,992
Via Panama			4,337	5,112
Havre	3,169	4,760		
Via New York			[2]6,360	[2]6,368
Hongkong			6,086	5,886
Via Port Townsend	[2]9,085	[2]8,865		
Via San Francisco	[2]9,277	[2]8,568		
Via Tehuantepec	10,572	9,317		
Via Panama	11,431	10,830		
Via Suez	11,610	12,892		
Via Cape of Good Hope	13,590	13,863		
Via Magellan Strait	16,868	17,318		
Honolulu			2,097	2,370
Via San Francisco	[2]5,288	[2]4,579		
Via Port Townsend	[2]5,569	[2]5,349		
Via Panama	6,686	6,085		
Via Tehuantepec	5,806	4,582		
Via Magellan Strait	13,269	13,719		
Kingston, Jamaica	1,473	1,165		
Kongo River, mouth of	5,662	6,580		
Via New Orleans			[2]9,062	[2]9,559
Via New York			[2]8,853	[2]8,859
Liverpool	3,053	4,553		
ViaNew York			[2]6,244	[2]6,250
Via Tehuantepec			7,169	7,944
Via Panama			8,038	8,813
Via Magellan Strait			13,503	14,278
London	3,233	4,507		
Via New York			[2]6,424	[2]6,432
Via Tehuantepec			7,349	8,124
Via Panama			8,218	8,993
Via Magellan Strait			13,683	14,458

Brest, France	2,954	4,458		
Via New York			[2] 6,145	[2] 6,154
Via Tehuantepec			7,154	7,929
Via Panama			7,840	8,619
Via Magellan Strait			13,209	13,984
Buenos Aires	5,868	6,318		
Via Magellan Strait			7,511	8,286
Via New York			[2] 9,059	[2] 9,067
Bermuda	676	1,648		
Via New York			[2] 3,867	[2] 3,875
Calcutta:				
Via Suez	9,830	11,239		
Via Cape of Good Hope	12,180	12,838		
Via Suez and New York			[2] 13,021	[2] 13,029
Via Cape of Good Hope and New York			[2] 15,371	[2] 15,379
Via Singapore			8,990	8,896
Via Singapore and San Francisco	[2] 12,181	[2] 11,462		
Via Singapore and Tehuantepec	13,405	12,181		
Via Singapore and Panama	14,230	13,694		
Callao:				
Via Tehuantepec	4,246	2,991		
Via Panama	3,392	2,764		
Via Magellan Strait	9,603	10,142		
Direct			4,012	4,769
Cape Town:				
Direct	6,815	7,374		
Via New York			[2] 10,006	[2] 10,014
Via Tehuantepec			9,700	10,475
Via Panama			9,898	10,676
Via Magellan Strait			10,454	11,229
Colon (eastern end of Panama Canal) [3]	1,981	1,380		
Via Canal and Panama			3,324	4,090
Colombo:				
Via Suez Canal	8,610	10,146		
Via Cape of Good Hope	11,130	11,684		
Via Suez and New York			[2] 11,801	[2] 11,809
Via Cape of Good Hope and New York			[2] 14,321	[2] 14,329
Via Singapore			8,900	8,700
Copenhagen:				
Direct	3,852	5,443		
Via New York			[2] 7,043	[2] 7,051
Gibraltar	3,207	4,576		
Via New York			[2] 6,398	[2] 6,406
Via Tehuantepec			7,240	8,015
Via Panama			7,642	8,417
Via Magellan Strait			12,734	13,509
Guam			5,054	4,908
Via San Francisco	[2] 8,245	[2] 7,536		
Via Port Townsend	[2] 8,107	[2] 7,887		

Manila:				
Via Honolulu and San Bernardino Strait			6,943	7,213
Via Yokohama			6,289	5,993
Via Yokohama and San Francisco	[2] 9,480	[2] 8,771		
Via Yokohama and Port Townsend	[2] 9,192	[2] 8,972		
Via Tehuantepec	10,735	9,480		
Via Panama	11,546	10,993		
Via Suez	11,556	12,946		
Via Cape of Good Hope	13,536	13,986		
Via Suez and New York			[2] 14,747	[2] 14,755
Via Cape of Good Hope and New York			[2] 16,727	[2] 16,735
Via Magellan Strait	16,736	17,145		
Marseille	3,876	5,266		
Via New York			[2] 7,067	[2] 7,073
Via Tehuantepec			7,930	8,705
Via Panama			8,332	9,107
Via Magellan Strait			13,324	14,099
Melbourne			7,040	7,311
Via San Francisco	[2] 10,231	[2] 9,522		
Via Panama	10,028	9,427		
Via Tehuantepec	9,852	8,604		
Via Magellan Strait	12,880	13,143		
Via Suez Canal	12,981	14,303		
Via Cape of Good Hope	12,670	12,933		
Mexico City	[2] 2,399 [4] 2,898	[2] 1,172 [4] 1,526	[2] 2,142 [4] 2,512	[2] 2,917 [4] 3,349
Naples	4,173	5,562		
Via New York			[2] 7,363	[2] 7,369
New Orleans	1,741 [4] 1,372		[4] 2,482	[4] 2,979
Via Tehuantepec			3,191	3,966
Via Panama			4,704	5,479
New York		1,741 [4] 1,372	[4] 3,191	[4] 3,199
Via Tehuantepec			4,415	5,190
Via Panama			5,305	6,080
Nome, Alaska			2,705	2,356
Via San Francisco	[2] 5,896	[2] 5,187		
Via Port Townsend	[2] 5,555	[2] 5,335		
Via Tehuantepec	7,130	5,902		
Via Panama	8,010	7,410		
Via Magellan Strait	15,840	16,249		
Odessa, via Gibraltar	5,370	6,760		
Panama (western end of Panama Canal) [3]			3,277	4,052
Via canal and Colon	2,028	1,427		
Pernambuco, Brazil	3,696	3,969		
Via New York			[2] 6,887	[2] 6,895
Via New Orleans			[2] 6,451	[2] 6,948
Via Tehuantepec			6,591	7,366

[1] Distances given are by water except as otherwise stated. [2] By land and water. [3] Distance by canal from Colon to Panama, 47 miles. [4] By land.

DISTANCES FROM NEW YORK, NEW ORLEANS, SAN FRANCISCO, AND PORT TOWNSEND TO THE PRINCIPAL PORTS OF THE WORLD AND THE PRINCIPAL CITIES OF THE UNITED STATES—Continued.

FOREIGN CITIES—Continued.

Port and route.	New York.	New Orleans.	San Francisco.	Port Townsend.
Pernambuco, Brazil—Continued.				
Via Panama			6,530	7,305
Via Magellan Strait			9,439	10,214
Port Said, Egypt	5,122	6,509		
Via New York			[1] 8,321	[1] 8,327
Via Tehuantepec			9,160	9,935
Via Panama			9,562	10,337
Port Townsend	[2] 3,199	[2] 2,979	775	
Via Tehuantepec	5,190	3,966		
Via Panama	6,080	5,479		
Punta Arenas (Magellan Strait)	6,890	7,340	6,199	6,958
Rio de Janeiro	4,778	5,218		
Via New York			[1] 7,909	[1] 7,977
Via New Orleans			[1] 7,700	[1] 8,197
Via Tehuantepec			7,730	8,505
Via Panama			7,678	8,453
Via Magellan Strait			8,339	9,114
San Francisco	[2] 3,191	[2] 2,482		775
Via Tehuantepec	4,415	3,191		
Via Panama	5,305	4,704		
St. Petersburg:				
Direct	4,632	6,223		
Via New York			[1] 7,823	[1] 7,829
San Juan, P. R.	1,428	1,539		
Via New York			[1] 4,619	[1] 4,627
Via New Orleans			[1] 4,021	[1] 4,518
Via Tehuantepec			4,182	4,957
Via Panama			4,345	5,120
Via Magellan Strait			12,190	12,974
Singapore			7,502	7,206
Via San Francisco	[1] 10,693	[1] 9,984		
Via Port Townsend	[1] 10,405	[1] 10,185		
Via Suez	10,170	11,560		
Via Cape of Good Hope	12,355	12,914		
Via Yokohama and Panama	13,104	12,503		
Via Yokohama and Tehuantepec	12,209	10,961		
Shanghai			5,550	5,290
Via San Francisco	[1] 8,741	[1] 8,032		
Via Port Townsend	[1] 8,489	[1] 8,269		
Via Tehuantepec	9,965	8,741		
Via Panama	10,855	10,254		
Via Suez	12,360	13,750		
Via Cape of Good Hope	14,593	14,806		
Tehuantepec:				
Western end of railroad [3]			2,139	2,904
Eastern end of railroad [3]	2,036	812		
Tutuila			4,150	4,607
Via San Francisco	[1] 7,341	[1] 6,632		
Valparaiso			5,140	5,902
Via San Francisco	8,331	7,622		
Via Tehuantepec	5,480	4,256		
Via Panama	4,637	4,035		
Via Magellan Strait	8,460	8,733		
Vladivostok			4,706	4,357
Via San Francisco	[1] 7,897	[1] 7,188		
Via Port Townsend	[1] 7,556	[1] 7,336		
Via San Francisco and Tehuantepec	9,122	8,874		
Via San Francisco and Panama	10,001	9,410		
Via Magellan Strait	17,036	17,445		
Wellington, New Zealand			5,909	6,415
Via San Francisco	[1] 9,100	[1] 8,391		
Via Tehuantepec	8,344	7,096		
Via Panama	8,540	7,939		
Via Magellan Strait	11,500	11,773		
Via Suez	14,230	15,620		
Via Cape of Good Hope	13,710	14,058		
Yokohama			4,536	4,240
Via Honolulu			5,500	5,770
Via San Francisco	[1] 7,727	[1] 7,018		
Via Port Townsend	[1] 7,439	[1] 7,219		
Via Honolulu and Tehuantepec	9,243	7,995		
Via San Francisco and Tehuantepec	8,986	7,762		

DISTANCES FROM ATLANTIC TO PACIFIC PORTS BY THE PRESENT ROUTES.
(In Nautical Miles.)
(Prepared expressly for The American Almanac by Captain W. H. H. Sutherland, Hydrographer, U. S. Navy.)

From.	To Port Townsend, via San Francisco.	To San Francisco.	To Guayaquil.	To Callao.	To Iquique.	To Valparaiso.	To Coronel.	To Yokohama, via San Francisco.	To Shanghai, via San Francisco and Yokohama.	To Manila, via San Francisco and Yokohama.	To Sydney, via Tahiti.	To Melbourne, via Tahiti and Sydney.	To Wellington, via Tahiti.
New York	14,019	13,244	10,423	9,702	9,221	8,461	7,860	17,780	18,910	19,530	14,560	15,135	13,600
Norfolk	13,945	13,170	10,349	9,628	9,147	8,387	7,786	17,706	18,836	19,456	14,486	15,061	13,526
Charleston	13,954	13,179	10,358	9,637	9,156	8,396	7,795	17,715	18,845	19,465	14,495	15,070	13,535
Port Tampa	14,119	13,344	10,523	9,802	9,321	8,561	7,960	17,880	19,010	19,630	14,660	15,235	13,700
New Orleans	14,419	13,644	10,823	10,102	9,621	8,861	8,260	18,180	19,310	19,930	14,960	15,535	14,000
Galveston	14,601	13,826	11,005	10,284	9,803	9,043	8,442	18,362	19,492	20,112	15,142	15,717	14,182
Liverpool	14,619	13,844	11,023	10,302	9,821	9,061	8,460	18,380	19,510	20,130	15,160	15,735	14,200
Hamburg	15,019	14,244	11,423	10,702	10,221	9,461	8,860	18,780	19,910	20,530	15,560	16,135	14,600
Antwerp	14,754	13,979	11,158	10,437	9,956	9,196	8,595	18,515	19,645	20,265	15,295	15,870	14,335
Bordeaux	14,474	13,691	10,868	10,157	9,676	8,916	8,315	18,235	19,365	19,985	15,015	15,590	14,055
Gibraltar	13,518	12,743	9,922	9,211	8,720	7,960	7,359	17,009	18,409	19,030	14,059	14,634	13,099

DISTANCES FROM ATLANTIC PORTS TO PACIFIC PORTS, VIA THE PANAMA CANAL, WHEN CONSTRUCTED.
(From a special report by the United States Treasury Department.)

From.	To Port Townsend, via San Francisco.	To San Francisco.	To Guayaquil.	To Callao.	To Iquique.	To Valparaiso.	To Coronel.	To Yokohama, via San Francisco*	To Shanghai, via San Francisco and Yokohama.*	To Manila, via San Francisco and Yokohama.*	To Sydney, via Tahiti.†	To Melbourne, via Tahiti‡ and Sydney.†	To Wellington, via Tahiti.§
New York	6,074	5,299	2,864	3,359	4,021	4,630	4,838	9,835	10,885	11,585	9,852	10,427	8,892
Norfolk	5,872	5,097	2,662	3,157	3,819	4,428	4,636	9,634	10,684	11,384	9,650	9,858	8,690
Charleston	5,673	4,898	2,463	2,958	3,638	4,229	4,437	9,344	10,367	10,809	9,451	10,006	8,491
Port Tampa	5,328	4,553	2,098	2,593	3,255	3,864	4,072	9,069	10,119	10,819	9,086	9,661	8,126
New Orleans	5,477	4,698	2,263	2,758	3,420	4,029	4,237	9,234	10,284	10,984	9,251	9,826	8,291
Galveston	5,574	4,799	2,364	2,858	3,520	4,129	4,338	9,335	10,385	11,085	9,352	9,927	8,392
Liverpool	8,813	8,038	5,603	6,098	6,760	7,369	7,577	12,574	13,624	14,324	12,591	13,166	11,631
Hamburg	9,242	8,467	6,032	6,527	7,189	7,798	8,006	13,003	14,053	14,753	13,020	13,595	12,060
Antwerp	8,963	8,188	5,753	6,248	6,910	7,519	7,727	12,724	13,774	14,474	12,741	13,316	11,781
Bordeaux	8,713	7,938	5,503	5,998	6,660	7,269	7,477	12,474	13,524	14,224	12,491	13,066	11,471
Gibraltar	8,447	7,672	5,237	5,723	6,394	7,003	7,211	12,208	13,258	13,958	12,221	11,168	11,265

* Via Honolulu, add 252 miles.
† Omitting Tahiti reduces voyage from Brito by 52 miles.
‡ Voyage from Brito to Sydney by way of Wellington is 232 miles less than by way of Tahiti; from Panama it is 405 miles less.
§ Voyage from Brito to Wellington direct is 185 miles shorter than via Tahiti, and from Panama it is 358 miles shorter.

VIEW AT ATLANTIC ENTRANCE.

THE NEW MUNICIPAL BUILDING OF THE CITY OF NEW YORK.

This building houses many departments of the city government and saves hundreds of thousands of dollars annually in rent.

CHAPTER IX.

TELEGRAPHS AND CABLES.

THE PREPARATION OF DOMESTIC TELEGRAPH MESSAGES.

A message to be transmitted by telegraph should be written upon the blank provided by the Telegraph Company for that purpose; or it should be attached to such blank by the sender, or by the one presenting the message as the sender's agent, so as to leave the printed heading in full view above the written message.

Write the whole message, date, address, body and signature as clearly as possible. Avoid changes, corrections and unusual abbreviations. Figures, counted and charged for at the rate of one word for each, may be used, but words to represent them are less liable to cause error.

Addresses are not charged for, therefore they should be full and clear and written so as to be easily understood. If the person addressed is known to be at a considerable distance from the office, or in some locality where the services of a special messenger may be required to reach him, this fact should be made known to the Telegraph Company. By such notice a quicker delivery of the message may be often effected.

If the sender's address is not known to the Telegraph Company, it should be written on the back or at the bottom of the blank. This will enable the Telegraph Company to reach him either with a reply, should one be received or for any possible question which might arise in reference to the transmission or delivery of his message.

Rules for counting messages, which will completely cover all the usual and unusual words, abbreviations and combinations used in telegraph messages, cannot be given here. A charge is made for the first ten words or less, and a reduced rate for each word over ten. The address and signature are not charged for.

In counting a message "dictionary" words (*i. e.*, words taken from one of the following languages, namely, English, German, French, Italian, Dutch, Portuguese, Spanish and Latin), initial letters, surnames of persons, names of cities, towns, villages, states or territories, or names of the Canadian provinces, will be counted and charged for each as one word. The abbreviations for the names of towns, villages, states, territories and provinces will be counted and charged for the same as if written in full. Abbreviations of weights and measures in common use will be counted each as one word.

Examples:

Signatory (English)	1 word
Auf wiedersehen (*German*)	2 words
A bon marché (*French*)	3 "
Erba mala presto cresce (*Italian*)	4 "
El corazón menda las carnes (*Spanish*)	5 words
Errare humanum est (*Latin*)	3 "
J G M Jones, Jr.	5 "
Van Dorne	1 "
McGregor	1 "
O'Connor	1 "
District of Columbia (or D. C.)	1 "
New York (or N. Y.)	1 "
New York State	2 "
St. Louis	1 "
East St. Louis	1 "
New Mexico (or N. M.)	1 "
Nova Scotia (or N. S.)	1 "
Lbs.	1 "
Hhds.	1 "
Cwt.	1 "

In names of countries or counties all the words will be counted and charged for.

Examples:

United States of Colombia	4 words
U. S. A.	3 "
North America	2 "
Queen Anne County	3 "

All groups of letters, when such groups do not form dictionary words, and are not combinations of dictionary words, will be counted at the rate of five letters or fraction of five letters to a word. When such groups are made up of combinations of dictionary words, each dictionary word so used will be counted.

Examples:

Ukugu (*artificial*)	1 word
Babelu (*artificial*)	2 "
Bacyzafyih (*artificial*)	2 "
Abycazfybgk (*artificial*)	3 "
Hhgga (*artificial*)	1 "
Doyou (*improperly combined*)	2 "
Canhe (*improperly combined*)	2 "
Allright (or alright) (*improperly combined*)	2 "
Housemate (*dictionary word*)	1 "

Figures, decimal points and bars of division will be counted, each separately, as one word. In groups consisting of letters and figures, each letter and figure will be counted as one word.

Examples:

A1	2 words
x9n8g	5 "
¾	3 "
74 ¾	5 "
4442	4 "
44, 42	5 "
165 East 22d St.	8 "

Exceptions:

A. M.	1 word
P. M.	1 "
F. O. B. (or fob)	1 "
C. O. D. (or cod)	1 "
C. I. F. or C. F. I.	1 "
(or cif or cfi)	1 "
C. A. F. (or caf)	1 "
O. K.	1 "
Per cent (or percent)	1 "

In ordinal numbers the affixes st, nd, rd and th will each be counted as one word.

Examples:

1st	2 words
2nd	2 "
3rd	2 "
4th	2 "

RECEIPTS AND EXPENDITURES OF THE UNITED STATES GOVERNMENT FOR THE FISCAL YEAR ENDING JUNE 30, 1908.

While the amounts shown are usually increasing annually, the relation they bear to each other is practically constant and hence the drawing is useful as a means of comparison.

LAND LINES OF THE WORLD

Below are given such particulars as we have been able to obtain of the land line telegraphs throughout the world, corrected up to December, 1912:

Countries.	Length of Lines in Miles.			Length of Conductors in Miles.			Pneumatic Tubes. (Yards)
	Aerial.	Underground.	Total.	Aerial.	Underground.	Total.	
America (United States of)—......							
Commercial Cable Co.	27,921	183	28,104	202,850	10,031	212,881	11,066
[1]Western Union Tel. Co.	207,520	446	207,966	1,459,160	57,178	1,496,338	....
Argentine Republic.	13,596	20	13,616	32,779	80	32,859	....
Austria	28,872	184	29,056	141,918	4,265	146,183	95,534
Belgium	4,694	19	4,713	24,451	1,074	25,525	1,032
Bolivia	1,795	....	1,795	....	....	....	....
Brazil	20,241	14	20,255	37,166	94	37,260	23,731
British East Africa..	1,039	....	1,039	2,284	....	2,284	50
British Guiana......	350	....	350	2,051	....	2,051	....
British India.......	72,553	193	72,746	284,067	3,199	287,266	....
British North Borneo	800	....	800	900	....	900	....
Bulgaria	4,043	2	4,045	9,436	67	9,503	....
Canada—Gt. N.-W. Tel. Co.	10,818	....	10,818	52,199	....	52,199	....
Canadian Pacific Telegraphs.....	12,255	2	12,257	75,872	886	76,758	....
Government Tel. Service.........	8,383	....	8,383	7,900	....	7,900	....
WesternUnionTel. Co.	2,707	11	2,718	13,979	44	14,023	....
Ceylon	1,830	2	1,832	4,940	50	4,990	....
Chili	7,473	....	7,473	13,408	....	13,408	....
China	25,308	6	25,314	41,805	102	41,907	....
Colombia	620	....	620	....	....	....	....
Costa Rica	835	....	835	....	....	....	....
Cuba	7,119	....	7,119	7,119	....	7,119	....
[2]Denmark	3,242	64	3,306	7,339	230	7,569	....
Dominican Republic	1,728	....	1,728	1,728	....	1,728	....
East African Protectorate.........	1,016	....	1,016	2,261	....	2,261	....
Ecuador	3,754	4	3,758	....	....	....	....
Egypt	3,871	....	3,871	12,762	....	12,762	....
France and Corsica..	86,214	4,315	90,529	329,525	25,517	355,042	354,987
French Guiana (Cayenne).......	195	....	195	195	....	195	....
French Indo-China (Cochin-China, Cambodgia, Annan, Tonkin and Laos)...........	8,417	8	8,425	14,231	108	14,339	....
French Guinea.....	1,430	....	1,430	1,430	....	1,430	....
French Ivory Coast.	1,584	....	1,584	1,584	....	1,584	....
French Dahomey...	1,143	....	1,143	1,143	....	1,143	....
French Congo and Dependencies.....	1,600	....	1,600	1,600	....	1,600	....
[3]Germany	139,450	4,045	143,495	401,716	29,706	431,422	287,627
Great Britain and Ireland..........	56,039[4]	6,300[5]	62,239	teleg'ph. 171,534 telep'ne. 726,028	129,743 1,661,232	2,688,537	175,194
Greece	5,029	....	5,029	....	....	....	....
Carried forward..	775,484	15,818	791,202	4,087,360	1,923,606	5,990,966	949,221

[1]Inclusive of 388 miles of submarine cable, with 45 conductors.
[2]Exclusive of 206 miles of river cables and 526 miles of conductors.
[3]Including inter-urban telephone lines.
[4]No distinction can be made between telegraph and telephone line mileages, as the lines largely carry both telegraph and telephone conductors.
[5]Miles of single pipe.

LAND LINES OF THE WORLD

Below are given such particulars as we have been able to obtain of the land line telegraphs throughout the world, corrected up to December, 1912:

Countries.	Length of Lines in Miles.			Length of Conductors in Miles.			Pneumatic Tubes. (Yards)
	Aerial.	Underground.	Total.	Aerial.	Underground.	Total.	
Brought forward..	775,484	15,818	791,202	4,087,360	1,923,606	5,990,966	949,221
[1]Holland..........	6,312	301	6,613	67,608	1,413	69,021	....
Hungary..........	15,825	78	15,903	15,902	1,593	17,495	....
Indo-European Persian Gulf System (Mekran Coast)..	1,122	....	1,122	2,195	....	2,195	....
Indo-European Teheran, Bushire and Central Lines	1,605	....	1,605	4,799	....	4,799	....
Italy..............	31,994	37	32,031	193,208	1,335	194,543	....
Jamaica...........	992	....	992	....	....	....	....
[2]Japan............	23,008	27	23,035	110,159	1,723	111,822	2,507
Luxemburg........	455	....	455	715	....	715	....
Madagascar........	2,380	....	2,380	2,380	....	2,380	....
Malay States (Federated)..........	1,632	5½	1,637½	5,135	....	5,135	....
Mauritius..........	184	25	209	463	100	563	....
Mexico............	22,771	3	22,774	50,344	3	50,347	....
Netherlands India..	6,114	155	6,269	10,635	182	10,817	....
New Caledonia.....	632	....	632	966	....	966	....
New South Wales...	18,045	257	18,302	111,578	26,549	138,127	1,485
New Zealand.......	13,343	12½	13355½	77,242	5,682	82,924	....
[3]Nicaragua.........	3,471[3]	....	3,471[3]	....	....	....	....
Norway...........	11,254	91	11,345	64,876	39,589	104,465	44
Peru..............	8,666	....	8,666	10,092	....	10,092	....
Portugal...........	5,708	....	5,708	12,564	....	12,564	....
Portuguese Colonies.	2,055	....	2,055	2,155	....	2,155	....
Queensland........	10,568	79	10,647	23,525	174	23,699	470
Roumania.........	4,517	16	4,533	11,707	196	11,903	....
Russia.............	108,106	162	108,268	385,612	1,087	386,699	....
Senegal:—							
Sénégal..........	1,357	4	1,361	1,897	4	1,901	....
H. L. Sénégal Niger..........	3,337	....	3,337	4,023	....	4,023	....
Servia.............	4,349	3	4,352	8,289	76	8,363	....
South Australia.....	6,491	43	6,534	23,169	18,716	41,885	661
Spain..............	21,738	70,010	21,808	49,148	340	49,488	....
Straits Settlements..	1,292[4]	....	1,292	1,292	....	1,292	....
Sudan.............	4,777	....	4,777	9,896	....	9,896	....
Sweden............	5,976	41	6,017	19,397	768	19,865	....
Switzerland........	54,217	272	54,489	43,547	2,785	16,332	....
Tasmania..........	2,137	8	2,145	4,320	1,271	5,591	....
Tunis.............	2,077	5	2,082	5,905	60	5,965	....
Turkey............	27,560	....	27,560	46,876	....	46,876	....
Uganda Protectorate	859	....	859	1,017	....	1,017	....
Union of South Africa...........	17,216	11	17,227	62,531	546	63,077	683
Uruguay..........	4,898	....	4,898	4,898	....	4,898	....
Victoria:—							
Postal Dept......	4,044	10	4,054	11,810	610	12,420	3,967
Railway Dept....	3,218	2	3,220	5,851	108	5,959	....
Western Australia:—							
Postal Dept......	6,975	35	7,010	16,498	5,498	22,996	23
Railway Dept....	2,598	....	2,598	7,022	....	7,022	....
Total...........	1,251,359	87,511	1268830	5,578,606	2,034,014	7,563,258	959,061

[1]Inclusive of 193 nautical miles of river cables and 504 miles of conductors.
[2]Exclusive of 23,611 nautical miles of river cables and 45,321 miles of conductors.
[3]Exclusive of 1½ miles of submarine cable.
[4]Including telephone lines.—*From Electric Trades Directory.*

TELEGRAPH RATES—NORTH AMERICA

BETWEEN NEW YORK CITY AND PLACES IN UNITED STATES AND CANADA.

Day rate 40–3, means 40 cents for ten words and 3 cents for each additional word; Night rate 30–2, means 30 cents for ten words and 2 cents for each additional word, etc. Address and signature are free. Western Union and Postal Rates are uniform.

Places.	Rate. Day.	Rate. Night.
Alabama	60–4	50–3
Alaska:		
Eagle City	3.80–35	3.80–35
Juneau	2.60–23	2.60–23
Nome	4.80–45	4.80–45
St. Michael	4.30–40	4.30–40
Sitka	2.40–21	2.40–21
Skagway	2.90–26	2.90–26
Valdez	3.40–31	3.40–31
Alberta	1.00–7 to 1.25–8	75–5 to 1.00–7
Arizona	1.00–7	1.00–7
Arkansas	60–4	50–3
British Columbia: Grand Forks, Nelson, New Westminster, Rossland, Vancouver, Victoria	1.00–7	1.00–7
Atlin	3.25–24	3.25–24
Port Simpson	2.75–19	2.75–19
California	1.00–7	1.00–7
Colorado	75–5	60–4
Connecticut	25–2	25–1
Delaware	30–2	25–1
District of Columbia:		
Washington	30–2	25–1
All other places	40–3	30–2
Florida	60–4	50–3
Georgia	60–4	50–3
Idaho	1.00–7	1.00–7
Illinois	50–3	40–3
Indiana	50–3	40–3
Iowa	60–4	50–3
Kansas	60–4	50–3
Kentucky	50–3	40–3
Louisiana	60–4	50–3
Maine: Portland	35–2	25–1
Other places	40–3 to 50–3	30–2 to 40–3
Manitoba: Winnipeg	75–5	60–4
Maryland: Annapolis, Baltimore, Frederick, Hagerstown	30–2	25–1
Cumberland	35–2	25–1
All other places	30–2 to 40–3	25–1 to 30–2
Massachusetts	25–2 to 30–2	25–1
Michigan: Detroit, Mount Clemens, Port Huron	40–3	30–2
All other places	50–3 to 60–4	40–3 to 50–3
Minnesota	60–4	50–3
Mississippi	60–4	50–3
Missouri:		
St. Louis	50–3	40–3
All other places	60–4	50–3
Montana	75–5	60–4
Nebraska	60–4	50–3
Nevada	1.00–7	1.00–7
New Brunswick	50–3	40–3
Newfoundland: St. John's	1.10–9	1.00–9
New Hampshire	30–2 to 35–2	25–1
New Jersey	25–2	25–1
New Mexico	75–5	60–4
New York:		
New York City	20–1	20–1
All other places	25–2 to 35–2	25–1
North Carolina	50–3	40–3
North Dakota	75–5	60–4
Nova Scotia	50–3	40–3
Ohio	40–3	30–2
Oklahoma	75–5	60–4
Ontario:		
Niagara Falls	40–3	30–2
Sault Ste. Marie	60–4	50–3
All other places	50–3 to 1.00–7	40–3 to 75–5
Oregon	1.00–7	1.00–7
Pennsylvania	25–2 to 40–3	25–1 to 30–2
Prince Edward Island: Charlottetown	75–5	65–5
Quebec	50–3	40–3
Rhode Island	30–2	25–1
Saskatchewan	1.00–7 to 1.25–8	75–5 to 1.00–7
South Carolina	60–4	50–3
South Dakota	75–5	60–4
Tennessee	50–3	40–3
Texas	75–5	60–4
Utah	75–5	60–4
Vermont	30–2 to 35–2	25–1
Virginia	40–3 to 50–3	30–2 to 40–3
Washington	1.00–7	1.00–7
West Virginia	40–3	30–2
Wisconsin: Milwaukee	50–3	40–3
All other places	60–4	50–3
Wyoming	75–5	60–4
Yukon: Dawson City	4.00–27	4.00–27

NIGHT LETTERS AND DAY LETTERS.

Table of Tolls for 1 to 200 Words.

Words	When Day Message Rate is 25 and 2		When Day Message Rate is 30 and 2		When Day Message Rate is 35 and 2		When Day Message Rate is 40 and 3	
	Night Letter Rate is	Day Letter Rate is	Night Letter Rate is	Day Letter Rate is	Night Letter Rate is	Day Letter Rate is	Night Letter Rate is	Day Letter Rate is
1 to 50	$0.25	$0.38	$0.30	$0.45	$0.35	$0.53	$0.40	$0.60
51 " 60	.30	.45	.36	.54	.42	.63	.48	.72
61 " 70	.35	.53	.42	.63	.49	.74	.56	.84
71 " 80	.40	.60	.48	.72	.56	.84	.64	.96
81 " 90	.45	.68	.54	.81	.63	.95	.72	1.08
91 " 100	.50	.75	.60	.90	.70	1.05	.80	1.20
101 " 110	.55	.83	.66	.99	.77	1.16	.88	1.32
111 " 120	.60	.90	.72	1.08	.84	1.26	.96	1.44
121 " 130	.65	.98	.78	1.17	.91	1.37	1.04	1.56
131 " 140	.70	1.05	.84	1.26	.98	1.47	1.12	1.68
141 " 150	.75	1.13	.90	1.35	1.05	1.58	1.20	1.80
151 " 160	.80	1.20	.96	1.44	1.12	1.68	1.28	1.92
161 " 170	.85	1.28	1.02	1.53	1.19	1.79	1.36	2.04
171 " 180	.90	1.35	1.08	1.62	1.26	1.89	1.44	2.16
181 " 190	.95	1.43	1.14	1.71	1.33	2.00	1.52	2.28
191 " 200	1.00	1.50	1.20	1.80	1.40	2.10	1.60	2.40

Words	When Day Message Rate is 50 and 3		When Day Message Rate is 60 and 4		When Day Message Rate is 75 and 5		When Day Message Rate is 100 and 7	
	Night Letter Rate is	Day Letter Rate is	Night Letter Rate is	Day Letter Rate is	Night Letter Rate is	Day Letter Rate is	Night Letter Rate is	Day Letter Rate is
1 to 50	$0.50	$0.75	$0.60	$0.90	$0.75	$1.13	$1.00	$1.50
51 " 60	.60	.90	.72	1.08	.90	1.35	1.20	1.80
61 " 70	.70	1.05	.84	1.26	1.05	1.58	1.40	2.10
71 " 80	.80	1.20	.96	1.44	1.20	1.80	1.60	2.40
81 " 90	.90	1.35	1.08	1.62	1.35	2.03	1.80	2.70
91 " 100	1.00	1.50	1.20	1.80	1.50	2.25	2.00	3.00
101 " 110	1.10	1.65	1.32	1.98	1.65	2.48	2.20	3.30
111 " 120	1.20	1.80	1.44	2.16	1.80	2.70	2.40	3.60
121 " 130	1.30	1.95	1.56	2.34	1.95	2.93	2.60	3.90
131 " 140	1.40	2.10	1.68	2.52	2.10	3.15	2.80	4.20
141 " 150	1.50	2.25	1.80	2.70	2.25	3.38	3.00	4.50
151 " 160	1.60	2.40	1.92	2.88	2.40	3.60	3.20	4.80
161 " 170	1.70	2.55	2.04	3.06	2.55	3.83	3.40	5.10
171 " 180	1.80	2.70	2.16	3.24	2.70	4.05	3.60	5.40
181 " 190	1.90	2.85	2.28	3.42	2.85	4.28	3.80	5.70
191 " 200	2.00	3.00	2.40	3.60	3.00	4.50	4.00	6.00

Night Messages.

Night messages are accepted at the following rates.

NIGHT MESSAGE RATES.

Where the Day Rate is	The Night Rate is
20—1	20—1
25—2	25—1
30—2	25—1
35—2	25—1
40—3	30—2
50—3	40—3
60—4	50—3
65—4	50—3
75—5	50—3
75—5	60—4
75—5	75—5
85—6	60—4
85—6	85—6
90—6	60—4
1.00—7	75—5
1.00—7	1.00—7
1.15—8	1.00—7
1.25—8	1.00—7
1.25—8	1.25—8

Night Letters or "Lettergrams."

Both of the large telegraph companies have inaugurated the night service which has been highly useful to the public, and which serves to utilize lines at night which would otherwise be idle.

Night letters may be accepted for all offices in the United States and Canada, and also including many telephone points.

The charge for night letters of fifty words or less will be the regular day rate for ten words, and one-fifth (1/5) of this rate will be charged for each additional ten words or less.

Night letters must be written in plain English. Code or cipher is not permitted. Night letters should be written on special night letter blanks. Night letters will be delivered as early as convenient the next morning.

The instructions that night letters must be written in "plain English language" do not disqualify words of an artificial character representing trade names or terms, trade designations of cotton shipments, brands or grades of flour, and other manufactured products. Trade names and trade designations are accepted without question, *provided they are used in their natural sense*, and are *not* used to convey a hidden meaning as code or cipher words do. For example, the expression "Uneeda" is the name of a product of a biscuit company. "XXX" is used to express a certain brand or grade of flour. "FHC," "AFC," "HLPH," represent cotton shippers' brands.

Day Letters.

The day letter service, offered only by the Western Union Telegraph Co., is similar in all respects to the night letter service except that delivery is made the same day, subject only to such delay as is involved in the subordination of the message to full paid traffic, and the tariff for fifty words or less is one and one half times the regular day rate for ten words.

The combined telegraph and telephone service is proving very useful. The plan is to allow those telephone subscribers whose local telegraph office is closed for the night to call up "Central" and be placed in communication with the nearest open telegraph office. If the service of the Western Union Co. is desired it is only necessary to say "Western Union." The Postal Telegraph Co. must be asked for by name also. This arrangement makes every telephone subscribers' station an always open telegraph office.

Money by Telegraph.

All telegraph companies accept orders, both domestic and foreign, for immediate transfer of money by telegraph and cable. It is sometimes imperative to obtain large or small sums at the shortest possible moment, certainly within twenty-four hours. Formerly this branch of the business was in the hands of bankers, but now the cable companies and telegraph companies are able to pay money in places all over the world. The organisation of telegraph and cable companies is a most complicated one, and there are many factors which control the rates.

Reduced charges for the transfer of money by telegraph to offices in the United States are as follows:

First:	For $25.00 or less	25c
	25.01 up to $50.00	35c
	50.01 " " 75.00	60c
	75.01 " " 100.00	85c

For amounts above $100.00 add (to the $100.00 rate) 25c per hundred (or any part of $100.00) up to $3,000.00. For amounts above $3,000.00 add (to the $3,000.00 rate) 20c per hundred (or any part of $100.00.)

Second: To the above charges are to be added the tolls for a fifteen-word day message from the office of deposit to the office of payment.

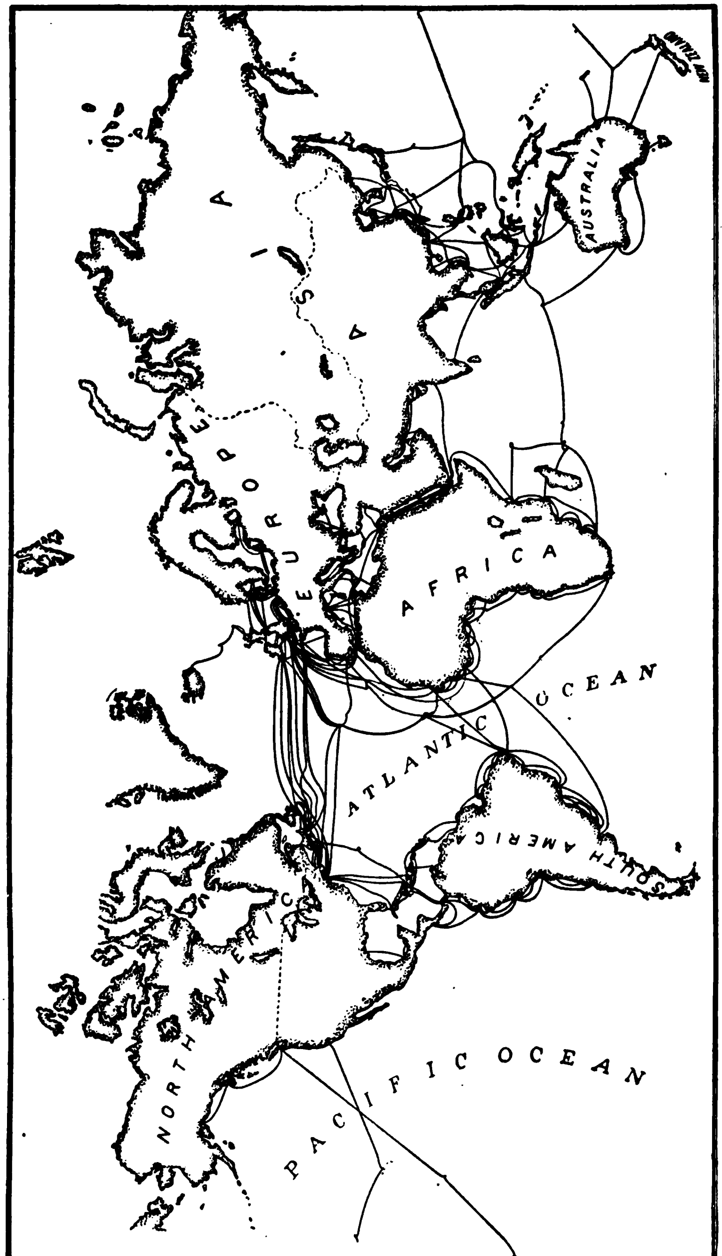
Miscellaneous Service.

Persons who wish to be notified of the arrival of steamers can make arrangements with the two telegraph companies to notify them of the arrival. The companies maintain signal stations at Fire Island, The Highlands, and Sandy Hook; also at Quarantine, for the purpose of reporting and sighting the arrival of steamers from foreign ports. To those who live in New York, or in nearby towns and cities, the notice will be received in ample time to reach the dock by the time the steamer warps in. The service for New York, New Jersey and Hoboken is $1.00. Parties in other places who are interested in incoming steamers can be notified by paying this fee of $1.00, plus the usual telegraph tolls for the ordinary ten-word message. For places not adjacent to New York, the notice conveys the intelligence of the near approach of home-coming steamers.

A cable between Syracuse and Tripoli was completed in July, 1912. It has a total length of 280 nautical miles, and is composed of five sections of different diameters. The middle portion measures 19 mm., the two intermediate lengths 28 mm., and those adjacent to the coast 35 mm.

TOLLS ON MESSAGES OF FROM 10 TO 50 WORDS.

No. of Words.	Rate 20–1	Rate 25–1	Rate 25–2	Rate 30–2	Rate 35–2	Rate 40–3	Rate 50–3	Rate 60–4	Rate 75–5	Rate 100–7
10	20	25	25	30	35	40	50	60	75	100
11	21	26	27	32	37	43	53	64	80	107
12	22	27	29	34	39	46	56	68	85	114
13	23	28	31	36	41	49	59	72	90	121
14	24	29	33	38	43	52	62	76	95	128
15	25	30	35	40	45	55	65	80	100	135
16	26	31	37	42	47	58	68	84	105	142
17	27	32	39	44	49	61	71	88	110	149
18	28	33	41	46	51	64	74	92	115	156
19	29	34	43	48	53	67	77	96	120	163
20	30	35	45	50	55	70	80	100	125	170
21	31	36	47	52	57	73	83	104	130	177
22	32	37	49	54	59	76	86	108	135	184
23	33	38	51	56	61	79	89	112	140	191
24	34	39	53	58	63	82	92	116	145	198
25	35	40	55	60	65	85	95	120	150	205
26	36	41	57	62	67	88	98	124	155	212
27	37	42	59	64	69	91	101	128	160	219
28	38	43	61	66	71	94	104	132	165	226
29	39	44	63	68	73	97	107	136	170	233
30	40	45	65	70	75	100	110	140	175	240
31	41	46	67	72	77	103	113	144	180	247
32	42	47	69	74	79	106	116	148	185	254
33	43	48	71	76	81	109	119	152	190	261
34	44	49	73	78	83	112	122	156	195	268
35	45	50	75	80	85	115	125	160	200	275
36	46	51	77	82	87	118	128	164	205	282
37	47	52	79	84	89	121	131	168	210	289
38	48	53	81	86	91	124	134	172	215	296
39	49	54	83	88	93	127	137	176	220	303
40	50	55	85	90	95	130	140	180	225	310
41	51	56	87	92	97	133	143	184	230	317
42	52	57	89	94	99	136	146	188	235	324
43	53	58	91	96	101	139	149	192	240	331
44	54	59	93	98	103	142	152	196	245	338
45	55	60	95	100	105	145	155	200	250	345
46	56	61	97	102	107	148	158	204	255	352
47	57	62	99	104	109	151	161	208	260	359
48	58	63	101	106	111	154	164	212	265	366
49	59	64	103	108	113	157	167	216	270	373
50	60	65	105	110	115	160	170	220	275	380



CABLE LINES OF THE WORLD.

SUBMARINE CABLES.

SUMMARY OF CABLES OWNED BY GOVERNMENT ADMINISTRATIONS.

Country.	Number of Cables with one or more cores.	Length in Nautical Miles. Of Cables.	Of Conductors.
Argentine Republic	22	84.000	240.000
Austria	83	681.300	685.000
Bahamas	1	211.000	211.000
Belgium	4[1]	100.900	462.216
Brazil	30	44.441	80.798
British Guiana	8	23.000	50.000
British India, Indo-European Telegraph Department Government Administration	157	1,988.652	1,988.652
Bulgaria (Widdin Cable)	1	0.538	0.538
Canada	51	258.000	258.000
Ceylon and India (Joint)	2	66.000	66.000
China	3[4]	955.400	955.400
Denmark (Telegraphs and Telephones)	142[1]	540.779[2]	1,750.842
France and Algeria	49[1]	2,596.070	2,680.244
France (Principal International and French Colonial Cables)	16	8,479.839	8,479.839
(French) Dahomey and Dependencies	....	1.078	1.078
Germany	97[1]	2,946.631	6,201.078
Great Britain and Ireland	220½	2,720.160	8,498.809
Greece	13	59.702	58.818
Holland	32	241.543	780.449
Inter-Colonial System	6	9,279.000	9,279.000
Italy	59	1,431.708	1,585.981
Japan	120	3,773.765	4,495.948
Mexico	6	357.698	434.681
Netherlands (Indies)	17	2,741.900	2,741.900
New South Wales	239	73.996	505.272
New Zealand	35	367.502	373.219
Norway	896[1]	1,376.579	2,293.316
Portugal	4	115.050	115.050
Queensland	22	53.510	56.930
Roumania	....	177.000	189.000
Russia in Europe, and the Caucasus	21	892.300	1,039.260
Russia in Asia	1	18.151	56.800
South Australia	3	54.000	54.000
Spain	25	3,129.813	3,129.813
Sweden	26	196.496	346.361
Switzerland	2	10.685	15.057
Tasmania	4	4.500	11.500
Tunis	....	4.312	4.312
Turkey in Europe and Asia	24	460.844	479.637
Union of South Africa	2	6.614	14.501
Uruguay	5	8.954	8.954
Victoria	3	380.995	380.995
Western Australia	3	13.550	23.350
	2,457½	46,927.955	61,083.598

[1]Including half of cables owned jointly with other Administrations. [2]Exclusive of Iceland, with 13 cables of 17 nautical miles and 28 miles of conductors. [3]Including 20 miles of subfluvial cable. [4]Exclusive of several small river cables.

In 1866 the Western Union Telegraph Co. had only 37,380 miles of line, and 75,686 miles of wire. The same year they had only 2,250 offices. The next year the number of offices had increased to 2,565, and 5,879,282 messages were transmitted. For the year ending June 30, 1912, there were 235,807 miles of line, 1,532,161.40 miles of wire and 25,392 offices. There were 84,901,657 messages sent, not including those over leased wires or under railroad contracts. The receipts amounted to $42,987,807.15 and the expenses were $36,063,836.10. The profits were $6,923,971.05.

SUMMARY OF CABLES OWNED BY PRIVATE COMPANIES.

	Number of Cables with one or more cores.	Length of Cables in Nautical Miles.
African Direct Telegraph Company	9	3,026
Amazon Telegraph Company	19	1,304
Anglo-American Telegraph Company	18	9,548
Canadian Pacific Railroad Company	10	102½
Central and South American Telegraph Company	21	11,793
Commercial Cable Company	15	17,274
Commercial Pacific	6	10,010
Commercial Cable Company of Cuba	1	1,285
Compagnie Française des Câbles Télégraphiques	24	11,430
Cuba Submarine Telegraph Company	12	1,540
Deutsch Atlantische Telegraphen-Gesellschaft	5	9,661
Deutsch-Niederlandische Telegraphen-Gesellschaft	3	3,416
Deutsch Sudamerikanische Telegraphen-Gesellschaft	3	5,811
Direct Spanish Telegraph Company	3	710
Direct United States Cable Company	3	3,171
Direct West India Cable Company	2	1,276
Eastern Telegraph Company	137	43,012
Eastern Extension, Australasia and China Telegraph Company	31	24,783
Eastern and South African Telegraph Company	18	10,517
Europe and Azores Telegraph Company	2	1,057
Great Northern Telegraph Company	29	8,039
Halifax and Bermudas Cable Company	1	851
Indo-European Telegraph Company	3	21
Mexican Telegraph Company	3	2,188
Osteuropäische Telegraphen-Gesellschaft	1	185
River Plate Telegraph Company	4	220
South American Cable Company	5	3,916
United States and Hayti Telegraph and Cable Company	1	1,415
West African Telegraph Company	8	1,471
West Coast of America Telegraph Company	7	1,973
West India and Panama Telegraph Company	22	4,355
Western Telegraph Company[1]	45	23,837
Western Union Telegraph Company	9	10,796
Total	480	230,053½

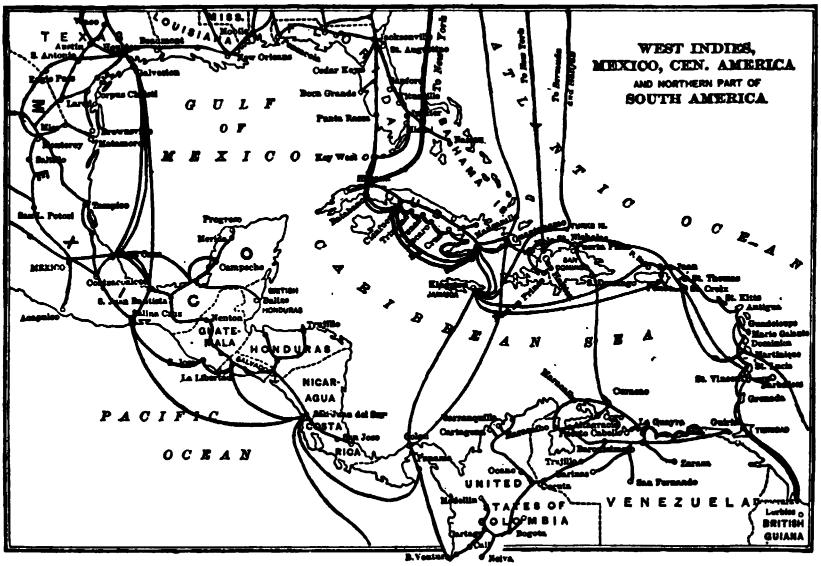
A new Western Union cable, 4,200 miles long, was laid in 1911, and is not included in above.

GENERAL SUMMARY.

	Number of Cables with one or more cores.	Length of Cables in Nautical Miles.
Government Administrations	2,457½	61,083½
Private Companies	480	230,053½
Total	2,937½	291,137

Partly extracted from the Official Documents issued by the Internationa Bureau of Telegraphic Administrations, Berne.—Electrical Trades Directory.

This table and that showing "Land Lines of the World" are the best obtainable, but are not believed to be free from error.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AND NORTHERN PART OF
SOUTH AMERICA
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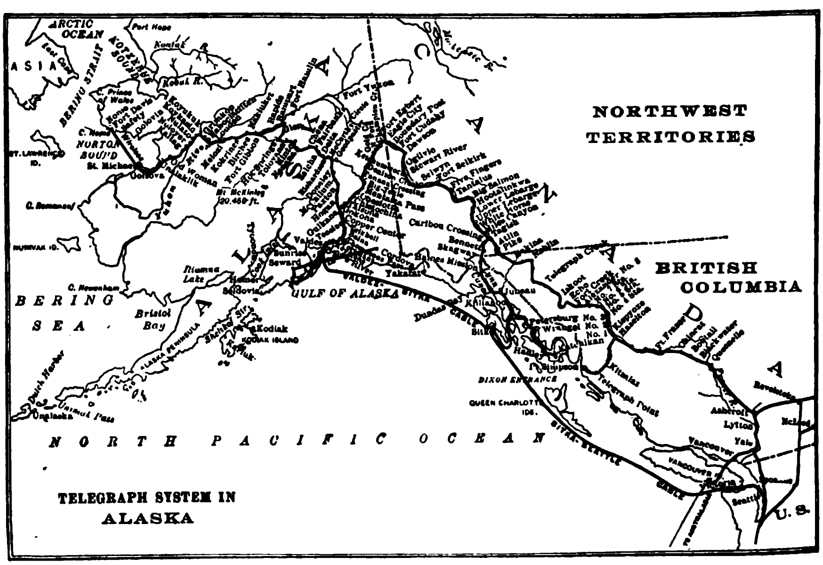
CARIBBEAN SEA
PACIFIC OCEAN
ATLANTIC OCEAN
HONDURAS
NICAR-AGUA
COSTA RICA
GUATE-MALA
UNITED STATES OF COLOMBIA
VENEZUELA
BRITISH GUIANA
New Orleans
Galveston
Jamaica
Bogota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BERING STRAIT
NORTHWEST TERRITORIES
BRITISH COLUMBIA
BERING SEA
Bristol Bay
GULF OF ALASKA
NORTH PACIFIC OCEAN
Fort Yukon
Kodiak
Seattle
U.S.
TELEGRAPH SYSTEM IN ALASKA

RULES FOR CABLE MESSAGES.

1. Every message must be prepaid, unless otherwise specially authorized, and all words in the address, text and signature are counted and charged for. No charge is made for the transmission of the name of the originating office.

ADDRESSES.

2. In the address of any message, the name of the office of destination, the name of the country and the name of the territorial subdivision are each counted as one word, no matter how many letters are employed.
3. The address of every message must consist of at least two words, the first indicating the name of the receiver and the second the name of the office of destination.
4. The sender is responsible for an incorrect or insufficient address. Corrections and alterations can only be made by a paid service message.
5. No message can be accepted (except at "Sender's Risk") when addressed to the care of a registered address unless the words "care" or "care of," or their equivalent, be placed between the addressee's name, or destination, and the registered address; thus a message for "Meyer, Berlin," to be delivered to the registered address "Dervish, Berlin," should be addressed "Meyer, care (or 'care of') Dervish, Berlin."
6. If an indication of any particular route be given by the sender and considered necessary by the company, it will be forwarded free; such indication, when given, must be transmitted immediately after the address; that is, as a part of the address, and before the text of the message.
7. Messages destined for places beyond the lines of telegraph must contain instructions as to the name of the place from which they are to be posted. Such instructions must be inserted as a part of the address, and must be paid for.

PLAIN MESSAGES.

8. Plain messages (*i. e.*, neither Code nor Cipher) may be written in any language that can be expressed in Roman letters. In such messages each word of fifteen letters or less is counted as a word, and words of over fifteen letters are counted at the rate of fifteen letters or fractions of fifteen letters to a word.

CODE MESSAGES.

9. Code messages may contain words belonging to one or more of the following languages: English, French, German, Italian, Dutch, Portuguese, Spanish and Latin. The use of words of other languages is not allowed. Code messages may also contain artificial words—that is, groups of letters so combined as to be pronounceable in at least one of the eight admitted languages. In code messages each code word (whether genuine or artificial) of ten letters or less is counted as a word, and no code word of more than ten letters can be accepted. If any words in plain language, and of more than ten letters each, are used in code messages, they are counted at the rate of ten letters or fraction of ten letters to a word.

CIPHER MESSAGES.

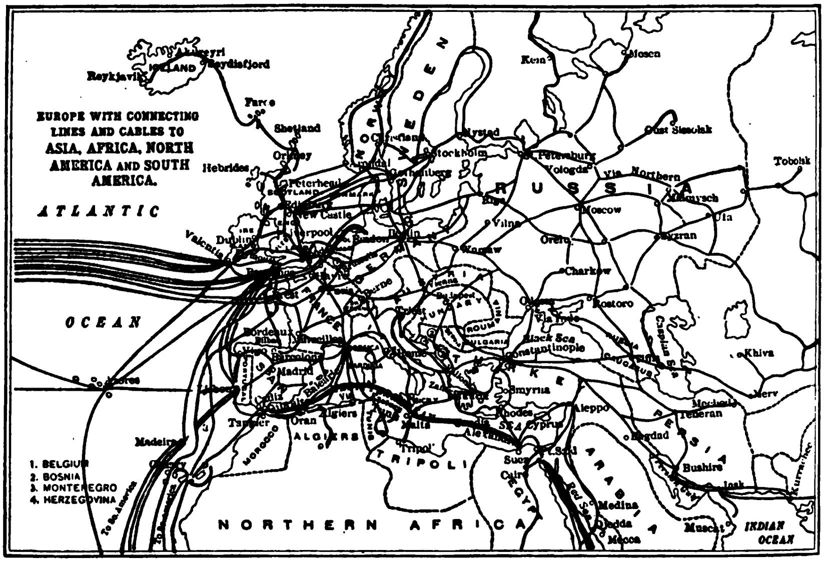
10. In cipher messages, which may be composed of groups of figures or of groups of letters, the groups are counted at the rate of five figures or letters, or fraction thereof, to a word.

COUNTING OF WORDS, ETC.

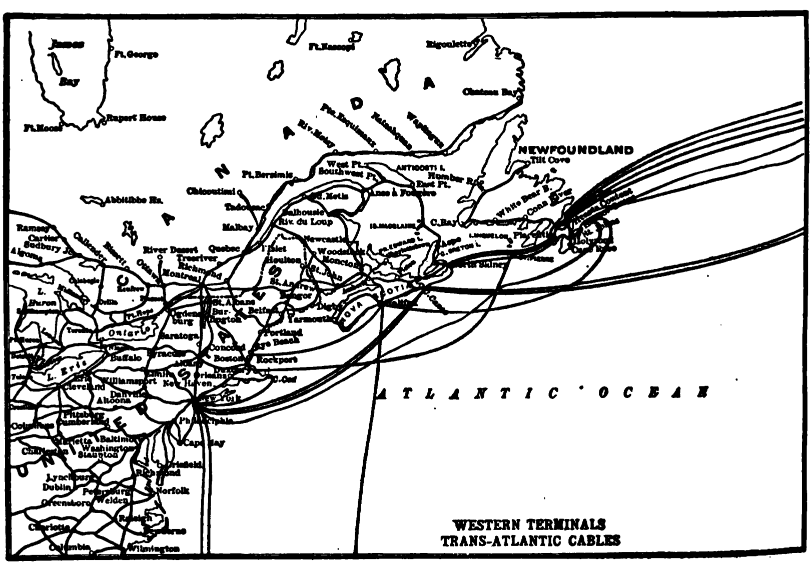
11. Every isolated figure, letter or character counts as one word.
12. Words joined by a hyphen or separated by an apostrophe are counted as so many separate words.
13. Signs of punctuation, hyphens and apostrophes are not counted or sent except upon formal demand of the sender, in which case they will be charged for as one word each.
14. When the letters "ch" come together in the spelling of a word, they are counted as one letter. In artificial words, however, the combination is counted as two letters.
15. Abbreviated and misspelled words and illegitimate compound words and words combined in a manner contrary to the usages of any of the languages authorized by Rule 9, also unpronounceable groups of letters (not trade-marks or marks of commerce), are inadmissible, but if they should accidentally appear in a message the unpronounceable groups will be counted at the rate of five letters, or fraction of five letters, as one word, and the others in accordance with the number of words they actually contain.
16. Inverted commas, the two signs of the parenthesis and each separate figure, letter or underline will be counted as one word. Groups of figures will be counted and charged for at the rate of five figures, or fraction thereof, as one word.
17. Decimal points and commas, used in the formation of numbers, also bars of division and letters added to figures to form ordinal numbers, are to be counted as a figure, and charged for at the rate of five figures, or fraction thereof, as one word.
18. The following examples will determine the interpretation of the rules to be followed in counting:

	In the Text Words.	In the Address Words.
Alright	2	
Unconstitutional (16 letters)	2	
A-t-il	3	
Aujourdhui	1	
Aujourd'hui	2	
Newyork	1	
New York	2	1
Frankfort Main	2	1
Frankfurtmain	1	1
Starokonstantinow (Town in Russia)	2	1
Emmingen Wurtemberg	2	1
Van de Brande	3	
Vandebrande	1	
Dubois	1	
Du Bois	2	
Hyde Park	2	
Hydepark (contrary to usage of the language)	2	

(Continued on page 293.)



The general day and night press cable rate between London and New York is 7 cents a word, with the following reduction at certain hours: London to New York, 12 midnight to 6 A. M. (London time), 5 cents a word; New York to London, 12 midnight to 6 A. M. and 1 P. M. to 4 P. M. (New York time), 5 cents a word.



(Continued from page 291)

	In the Text Words.
Saintjames Street	2
Saint James Street	3
44½ (4 figures and sign)	1
444,55 (5 figures and sign)	2
\$100	2
Onehundred dollars	2
10 fr. 50	3
11h 30	3
44	1
44 /2	1
2%	1
Two hundred and thirty four	5
Twohundredandthirtyfour (23 letters)	2
State of Maryland (name of ship)	3
Stateofmaryland (name of ship)	1
Emvchf (6 letters)	2
Ch 23 (trade mark)	1
$\frac{ap}{m}$ "	1
$\frac{3}{m}$ "	1
C. H. F. 45	2
The business is urgent, start at once (7 words and 2 underlines)	9
Send reply (if any) by mail (6 words and parentheses)	7
Explain "reversal" (2 words and inverted commas	3

REPETITIONS.

19. At the time of filing a message its sender may, upon payment of a quarter rate in addition to the ordinary tolls, order it repeated, in which case the various relay offices *en route* repeat it to each other as it passes. The words "REPETITION PAID," or the indication "T. C.," must be inserted immediately after the address; that is, as a part of the address and before the text, and is charged for.

The indication "T. C." counts as one word.

20. If repetition of a doubtful word or words be requested by the addressee of a message, the same may be procured by free service message to the office at which the message reached the lines, or to the CABLE DEPARTMENT, New York.

21. Every message exchanged between two telegraph offices to rectify a mistake of the sender is charged for at full rates.

ACKNOWLEDGMENT OF RECEIPT.

22. The sender may request that notice of the date and time at which his message is delivered to the addressee, or, when posted to destination, the date and time handed to the Post Office, be transmitted to him by telegraph or Postal Card. The words "ACKNOWLEDGMENT PAID," or the indication "P. C.," if notice is to be given by telegraph, or "P. C. P.," if notice is to be given by Postal Card, besides being transmitted in the check free, must be inserted immediately after the address, and is charged for. The indications "P. C." and "P. C. P." count each as one word.

The charge for a telegraphic "acknowledgment of receipt" is equal to that for a message of five words to same destination by same route.

PREPAID REPLIES.

23. The sender of a message may pay for a reply thereto, but he must decide as to the length of the reply paid for. The indications "R. P." (meaning Reply Paid), together with the number of words prepaid, must be inserted immediately before the address, that is, as a part of the address, and *is charged for*. The indication "R. P. 5," "R. P. 10," "R. P. 14," etc., counts as one word.

When accepting a message for which a reply *has been prepaid*, the originating office *will* collect, in addition to the charges therefor, the full charges for the reply as indicated.

The sender of such a message should understand that the toll paid for the reply is not a deposit, but is practically a remittance to his correspondent, to whom the foreign telegraph administrations deliver with the message a voucher specifying the amount and number of words paid for, which voucher entitles him to send free of charge, within the limits of the amount prepaid, a telegram to any destination whatever, and from any office of the administration whose office issued the voucher.

TABLE OF CABLE WORD RATES.

Following is a brief list of rates to some of the principal countries. The rate, of course, varies according to the location of the city or town in the United States. Thus, the rate from New York City to the Argentine Republic is 65 cents a word, while the rate from Mexico would be 74 cents a word. It is not feasible to give the rates from all of the states, as this can be readily obtained from the rate books of telegraph companies. The following rates give the cost per word from New York City:

Argentine Republic	\$0.65
Australia and New Zealand	.66
Austria	.32
Barbados	.91
Belgium	.25
British Guiana	1.08
Chili	.65
China,	
Macao	1.27
Other places	1.22
Cuba, Havana	.15
Cuba, other cities	.20
Denmark	.35
England	.25
France	.25
Germany	.25
Greece	.36
Holland	.25
Honolulu	.47
Hungary	.32
India	.74
Ireland	.25
Italy	.31
Jamaica	.48
Japan	1.33
Norway	.35
Panama Republic	.40
Peru	.65
Philippines (Manila)	1.12
Porto Rico	.50
Portugal	.39

Russia in Europe	$0.43
Scotland	.25
Spain, Prov. of Barcelona, Gerona, Lerida and Tarragona	.38
Spain, other offices	.40
Sweden	.38
Switzerland	.30
Turkey in Europe	.36
Uruguay	.65
Wales	.25

The rate from New York City to Great Britain, Ireland, France, Germany, Belgium and Holland is 25 cents a word. The rate in very few cases is increased more than 31 cents a word from inland places, except such states, etc., as Arizona, British Columbia, California, Idaho, Nevada, Oregon, Utah and Washington, where the rate is 37 cents per word. Arkansas, Colorado, most places in Florida, Iowa, Kansas, Louisiana, Manitoba, Minnesota, Missouri (other than St. Louis and a few other places), Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas and Wyoming have a rate of 34 cents a word. The rate from all the other states is 31 cents or less.

There are many places, particularly in Eastern, Northern and Southern Africa, which are very difficult to reach by cable and the rate is very high, amounting in some cases to as much as $4.86 per word. Any telegraph cable office will be glad to give specific information relative to such rates. The cable rates to the West Indies in some cases are very high, as for instance, Santo Domingo and Curacao to which the rates are $1.32 and $1.38 per word respectively from New York. The rates to South America are apt to be very high, particularly to Peru. The rate to Bermuda from New York City is 42 cents per word; to Turk's Island, 56 cents per word.

CABLE LETTERS.

Cable Letters, accepted at any hour, are taken at the low rate of 75 cents for 12 words and 5 cents for each additional word plus small additional charges beyond the cable stations and points of original destination. They must be written in plain language of the country of origin or destination. They are deliverable at the convenience of the company within 24 hours of the time of filing. Because of the additional charges beyond these places all Cable Letters not destined to London or Liverpool will be mailed beyond London unless otherwise arranged by sender.

If destined to points in Great Britain other than London or Liverpool the added charge for telegraphic delivery will be 12 cents for 12 words or less, cable count, and 1 cent for each additional word. If sent by telegraph to France the added charge will be 7½ cents per word, cable count; to Germany 9 cents per word, cable count; to Holland and Belgium 5 cents per word, cable count, and so on.

Plain English, or Anglicized foreign words in common use such as Chauffeur, Au revoir, etc., as used in a plain English message, may be accepted. No code words except those in registered addresses will be allowed.

Figures may be used in their natural sense in Cable Letters, and are counted as in regular cable messages.

The indication "R. P." including the number of words prepaid is counted and charged for as one word.

The term "deferred rate" should not be used in connection with Cable Letters.

DEFERRED CABLE SERVICE

Commencing January 1, 1912, a deferred cable service was inaugurated subject to all the rules and regulations of the regular cable service with the following exceptions:

1. Messages must be in plain language, either French or the language of country of origin or destination authorized for international correspondence. The use of two or more languages in the same message is not permitted.

2. All numbers except those used in address must be written in words at full length.

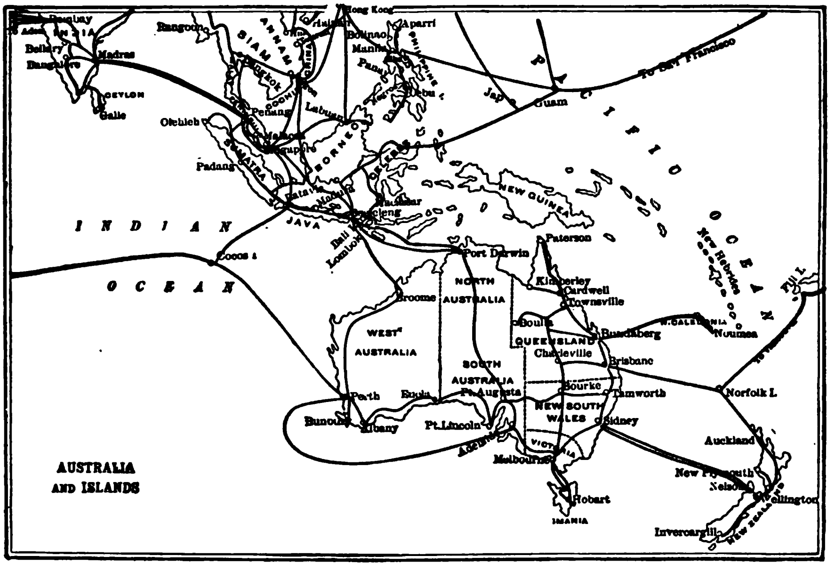
3. The messages must contain at least one text word.

4. Senders must in every case write before the address and pay for as one word the letters LCF, LCO or LCD, as in the nature of a declaration that the communication is in the French language or the language of country of origin or destination as case may be.

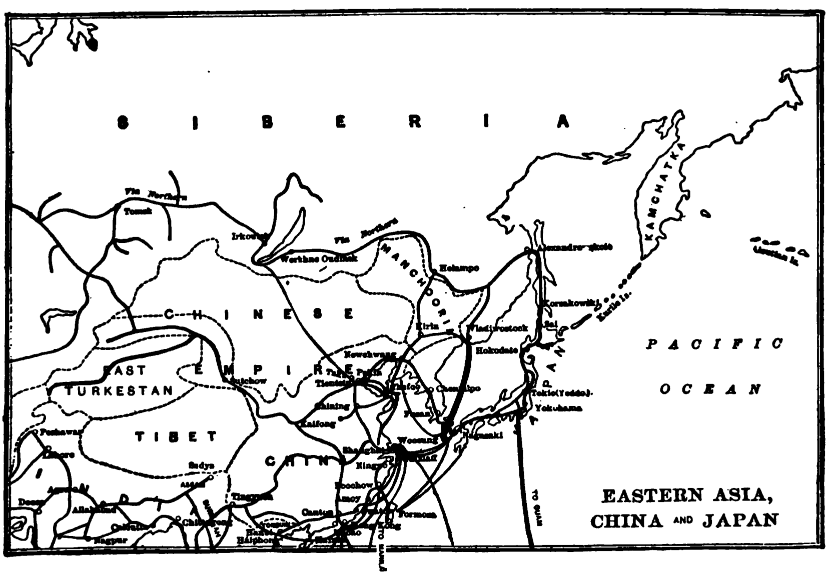
5. Messages are liable to be deferred in favor of those paid for at full rates, for a period not exceeding 24 hours. If delayed beyond that time they take their turn with full paid traffic.

6. Rate charged for deferred cables is one-half the rate charged for full paid cables between the same terminals except between points in Great Britain and Ireland on the one hand and in the United States and Canada on the other, when the deferred rate is 3½ cents less than half the regular rate from Hoboken and Jersey City, N. J., New York City and Yonkers, N. Y., Eastern Canada and New England States 3 cents less than half rate from other places.

Aden, Arabia.
Algeria.
Angola.
Argentine Republic.
Ascension Island.
Australia.
Austria.
Azores.
Balearic Islands.
Bathurst, British W. Africa.
Belgium.
Belgian Congo.
Borneo (British).
Brazil.
British East Africa and Uganda.
Burmah.
Canary Islands.
Cape Colony.
Cape Verde Island.
Ceylon.
Chile.
China:
  Amoy.
  Chefoo.
  Foochow.
  Hankow.
  Hong Kong.
  Macao.
  Pekin.
  Shanghai.
  Tientsin.
  Tsingtau.
  Weihaiwei.
  Cochin China.
Cocos Island.
Cyprus.
Dahomey.
Denmark.
Egypt.
Fanning Islands.
Fiji Islands.
France.
French Guinea.
French Indo China.
French West Africa.
  French Soudan.
  Mauretania.
  Senegal.
Germany.
German East Africa (except Bismarckburg and Udjidji.)
Gibraltar.
Gold Coast, Africa.
Great Britain and Ireland.
Greece.
Guinea Portuguese
Holland.
Hungary.
Iceland.
India (British).



AUSTRALIA
AND ISLANDS



EASTERN ASIA,
CHINA AND JAPAN

Indo China.
Italy.
Ivory Coast.
Labuan Island.
Luxemburg.
Madagascar.
Madeira Is.
Malta.
Mauritius Island.
Morocco (except Casablanca, Mogador and Rabat).
New Zealand.
Nigeria.
Norfolk Island.
Norway.
Obok.
Orange River Colony.
Paraguay.
Perim Island.
Peru.
Portugal.
Portuguese East Africa
Portuguese West Africa
Principe Island.
Reunion Island.
Rhodesia Northern (except Abercom, Fife, Rhodesia and Fort Jameson).
Rhodesia. (Southern).
Rodrigues Island.
St. Helena Island.
St. Thomas Island.
Senegal.
Servia.
Seychelles.
Sierra Leone.
Somaliland (British).
South African Union.
Spain.
Straits Settlements (Velantan excepted) and Malay States.
Sudan.
Sweden.
Switzerland.
Tasmania.
Transvaal.
Tunis.
Uruguay.
Zanzibar.

WEEK END LETTERS

Week End Letters filed before midnight Saturday are deliverable the following Monday morning. The rate is $1.15 for 24 words and 5 cents for each additional word, plus small additional charges between the cable stations and points of destination. Week end letters must be written in plain language of the country of origin or destination.

All Week End Letters not destined to London or Liverpool will be mailed beyond London unless otherwise arranged by sender.

If destined to points in Great Britain other than London or Liverpool the added charge for telegraphic delivery will be as given under "Cable Letters," same rules also apply for words, etc.

A nine-word message has been despatched from a newspaper office in New York back to the starting point, the lapse of time being exactly sixteen and one-half minutes. The message traveled via Honolulu, Manila, Hong Kong, Singapore, Bombay, Suez, Gibraltar and the Azores.

The first telegraph line in the United States was opened for business in 1844; the telephone was introduced in 1876 by Prof. A. G. Bell.

THE FIRST ATLANTIC CABLE.

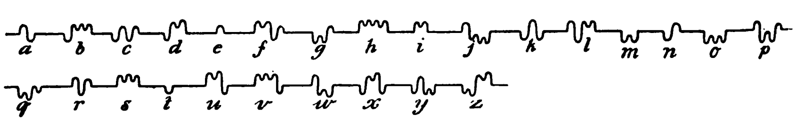
August 5th of 1908 was the fiftieth anniversary of the Atlantic Cable, that being the day of the month in 1858 on which—contrary to authoritative opinion—the engineer of one of the greatest achievements of the nineteenth century completed the laying of the submarine line between Ireland and Newfoundland, the length being over two thousand miles, and the depth nearly three miles for the greater part of the distance. The projectors were Mr. John Watkins Bright, Mr. (afterwards Sir Charles) Bright and Mr. Cyrus West Field. Mr. Bright was also the engineer-in-chief of the undertaking, and he received the honor of knighthood in recognition of his services to the country in connection therewith, at the unprecedented age of 26.

Electrical theories were, however, mistaken at that time, and the electricians applied far too much power for the transmission of signals, the result being that the insulation suffered by degrees, until after three months' useful work the cable gradually succumbed.

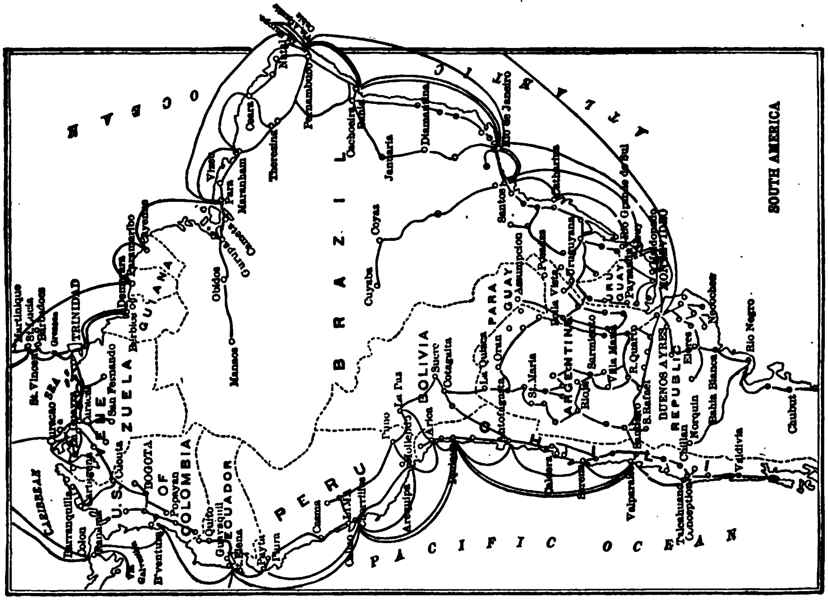
After a number of cables had been laid by Sir Charles Bright, Mr. H. C. Forde, Sir William Siemens and others to India, Gibraltar, Alexandria, &c., another Atlantic Cable expedition started in 1865. This was the first line that was laid by the manufacturers of the cable, these contractors being the Telegraph Construction and Maintenance Company, with Mr. (afterward Sir Samuel) Canning for their chief engineer, whilst Sir Charles Bright and Mr. Latimer Clark acted as consulting engineers to the proprietors. Notwithstanding the extra knowledge and experience gained in regard to the subject generally, this expedition met with as many mishaps as the first expedition of 1857; but in 1866—as in 1858—the same arrangements ultimately achieved success, since which the construction, laying, and working of submarine telegraphs has passed from the pioneer stage to that of ordinary routine.

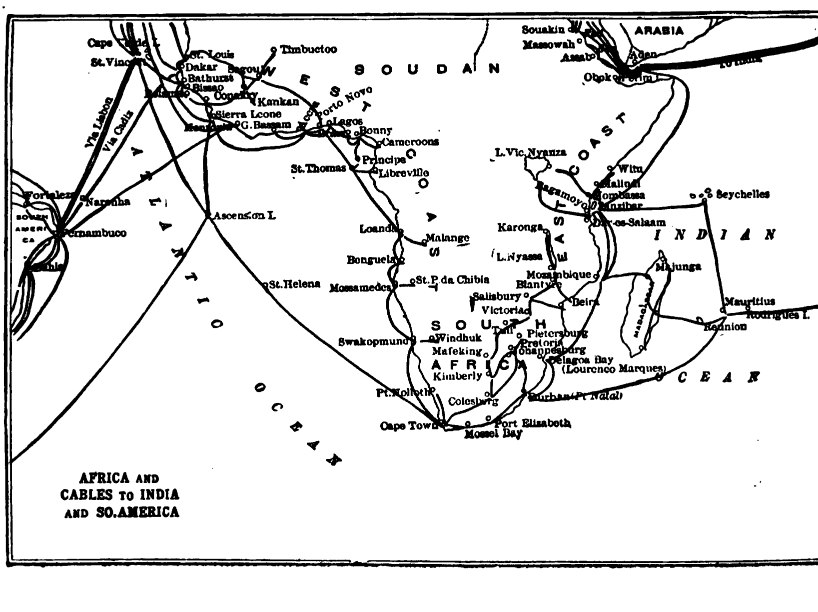
The engineering methods were similar to those adopted eight years previously; but the line proved a lasting success, owing to the advances made in electrical science and in the practical working of cables. On the electrical side, in addition of the late Lord Kelvin, the names of Varley and Willoughby Smith must always be honorably associated with the subject, and the late Sir John Pender did more than any man for the commercial development of submarine telegraphy.

THE CABLE ALPHABET.



The cut above shows the Morse Code as recorded by a syphon recorder. Syphon recorders are used for receiving cable messages. It will be observed that the spaces are represented by horizontal lines, dots by loops above the space lines, and dashes by loops below the space lines.


SOUTH AMERICA
ATLANTIC OCEAN
PACIFIC OCEAN
BRAZIL
PERU
BOLIVIA
COLOMBIA
ECUADOR
GUIANA
ARGENTINE REPUBLIC
PARAGUAY
URUGUAY
TRINIDAD
Pernambuco
Rio de Janeiro
Santos
Montevideo
Buenos Ayres
Valparaiso
Callao
Bahia Blanca
Rio Negro
Chubut
Valdivia
Manaos
Cuyaba
Goyas
Diamantina
Maranham
Para
Ceara


AFRICA AND
CABLES TO INDIA
AND SO. AMERICA
ARABIA
SOUDAN
WEST COAST
EAST COAST
SOUTH AFRICA
ATLANTIC OCEAN
INDIAN OCEAN
Timbuctoo
St. Louis
Dakar
Bathurst
Bissao
Conakry
Kankan
Sierra Leone
G. Bassam
Lagos
Porto Novo
Bonny
Cameroons
Principe
Libreville
St. Thomas
Loanda
Malange
Benguela
Mossamedes
St. Helena
Ascension I.
Pernambuco
Fernando Noronha
Via Lisbon
Via Cadiz
Cape Verde I.
St. Vincent
Swakopmund
Windhuk
Mafeking
Kimberly
Pt. Nolloth
Colesberg
Cape Town
Mossel Bay
Port Elizabeth
Durban (Pt Natal)
Delagoa Bay
(Lourenco Marques)
Johannesburg
Pretoria
Pietersburg
Salisbury
Victoria
Beira
Mozambique
Blantyre
L. Nyassa
Karonga
Dar-es-Salaam
Zanzibar
Mombassa
Malindi
Witu
Bagamoyo
L. Vic. Nyanza
Majunga
Mauritius
Reunion
Rodrigues I.
Seychelles
Souakin
Massowah
Assab
Aden
Obok
Perim
To India

· · · S "SAVE" — — — O "OUR" · · · S "SOULS"

WIRELESS ROOM OF U. S. REVENUE CUTTER "GRESHAM."

CHAPTER X.

WIRELESS TELEGRAPHY.

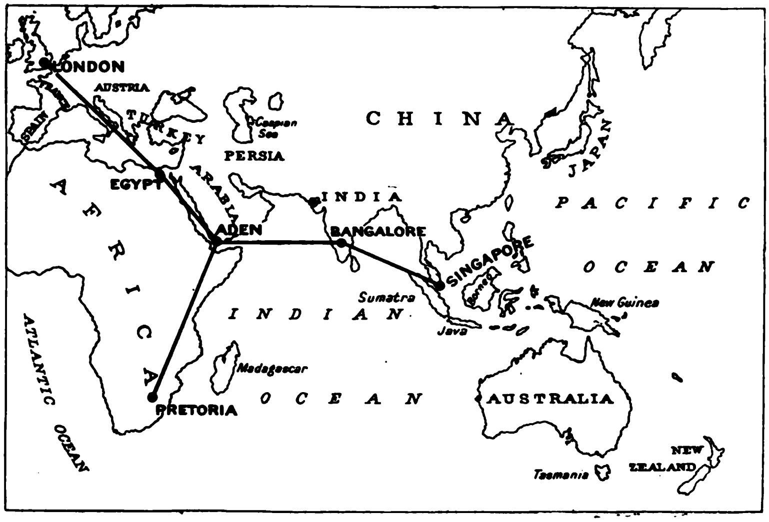
Wireless telegraphy is, in theory, closely allied to heliography, or signaling with flashes of light. The light used, however, is produced electrically and is invisible to the naked eye, owing to the fact that it is made up of very long waves, called Hertzian waves, which vibrate too slowly to affect the retina. The eye can only discern waves which make from 4,000 billions to 7,000 billions vibrations per minute. However, the Hertzian ray resembles light in that it can be reflected by a metallic plate and can be refracted by a prism of pitch, can be brought to a focus with a pitch lens, and may be polarized. Owing to the great length of the Hertzian waves, almost all substances are transparent to them. The Hertzian waves were discovered by Professor Heinrich Hertz, a young German philosopher, during his experiments with the spark discharge of Leyden jars and of the Ruhmkorff coil in 1886 and 1887.

He found that when a spark leaped the gap between the terminals, electric oscillations took place in these terminals which set up magnetic waves in the surrounding space, capable in turn of setting up similar oscillations in any adjacent conductor lying at an angle to them. The waves were detected by using a "resonator," which was merely a circle or a rectangle of copper wire formed with a gap in one side. When the induction coil was in operation and the resonator coil was held near the coil, a tiny stream of sparks would leap across the resonator gap. To better understand this phenomenon take as a crude example two vertical rods in a pool of water and on each a float free to slide vertically on the rod. Now, if one of these floats be moved up and down upon its rod, it produces waves in the water just as the electric oscillation produces waves in the ether. These spread out in all directions and on reaching the other float cause it to oscillate up and down, just as the magnetic waves produce electric oscillations in the resonator.

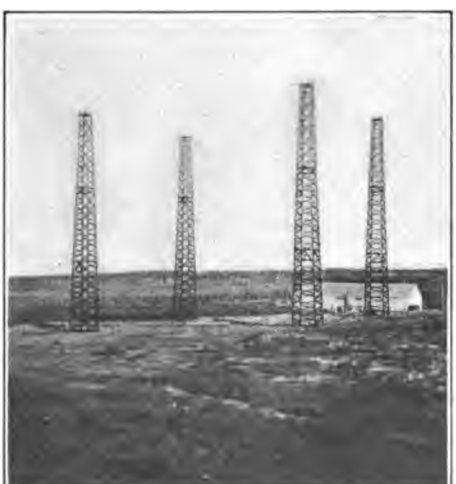
Without going into a detailed history of the development of wireless telegraphy from Hertz's experiments, it may be stated that the essential difference between the apparatus used by Hertz in his experiments and the several systems now commonly in use lies in the receiver. The transmitter is practically the same. A vertical wire called the antenna is connected to one terminal of the coil, and the other terminal is connected with the earth, the purpose being to increase the electrical capacity of the terminal rods and produce larger waves. Instead of producing the oscillations by means of an induction coil, they are now ordinarily produced by a dynamo and a step-up transformer except for telegraphing over short distances. But even with these changes we would not be able to telegraph over any appreciable distance if dependent upon the Hertz resonator for receiving a message, for, owing to the fact that the waves spread out in all directions from the transmitting antenna, the receiving antenna is acted upon by a very small proportion of the power expended by the transmitter, and this proportion decreases very rapidly as the distance between the transmitter and the receiver increases. In order then to detect the rays at long distances, a very sensitive instrument called the "coherer" has been invented. The coherer in its usual form consists of a glass tube with two metal pistons fitted therein between which a quantity of nickel filings is placed. The latter forms an imperfect electrical contact between the pistons, and takes the place of the spark gap in the receiving antenna. When the oscillations are set up in the antenna by the Hertzian waves, due to their high pressure or voltage, they break through the imperfect contact of the coherer, causing the filings therein to cohere or string together and thus produce a much better electric path through the coherer. The action is microscopic and cannot be detected with the naked eye. However, the coherer, aside from being a part of the antenna circuit, is also made a part of a local battery circuit, which contains a telegraph receiver, and whenever the electric oscillations open a good path through the filings for the local circuit, the telegraph instrument will be energized by the local battery only. In order to break this path after the oscillations have ceased, or, in other words, to cause the filings to decohere, they are constantly jarred apart by means of the "tapper," which is in reality an electric bell with the gong removed and the clapper striking the coherer tube instead. Carbon granules may be substituted for metallic filings, and in this case no tapper is necessary, the coherer being self-restoring.

In transmitting messages a telegraph key in the primary circuit of the induction coil is operated according to the usual Morse code, and this causes sparks to leap the spark gap at corresponding intervals. These signals will then be transmitted by the Hertzian waves to the receiving station, where they will be recorded by the telegraph receiver. The coherer is not by any means the only wave detector in use. Every wireless telegraph company has one or more different types of detectors.

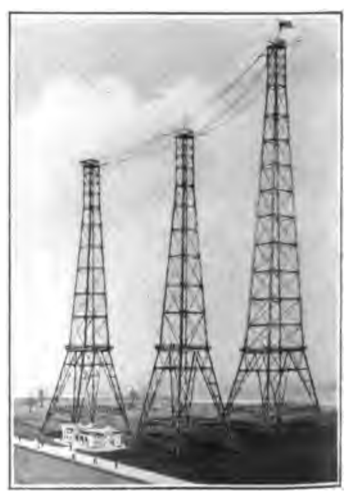
The Dover-Calais and Folkestone-Boulogne turbine steamers have been equipped with the Marconi wireless apparatus. The expense for telegrams from the ship to any part of England is 6 cents, with a minimum charge of 62 cents; to any part of France, Germany or Belgium, 9 cents a word; to Switzerland, Italy and Austria, 10 cents a word, and to Denmark, Sweden and Norway, 11 cents a word, with a minimum charge in each case of 75 cents.



MARCONI WIRELESS STATIONS FOR THE IMPERIAL TELEGRAPH SERVICE.



MARCONI HIGH POWER STATION AT SOUTH WELLFLEET, MASS. (CAPE COD.)



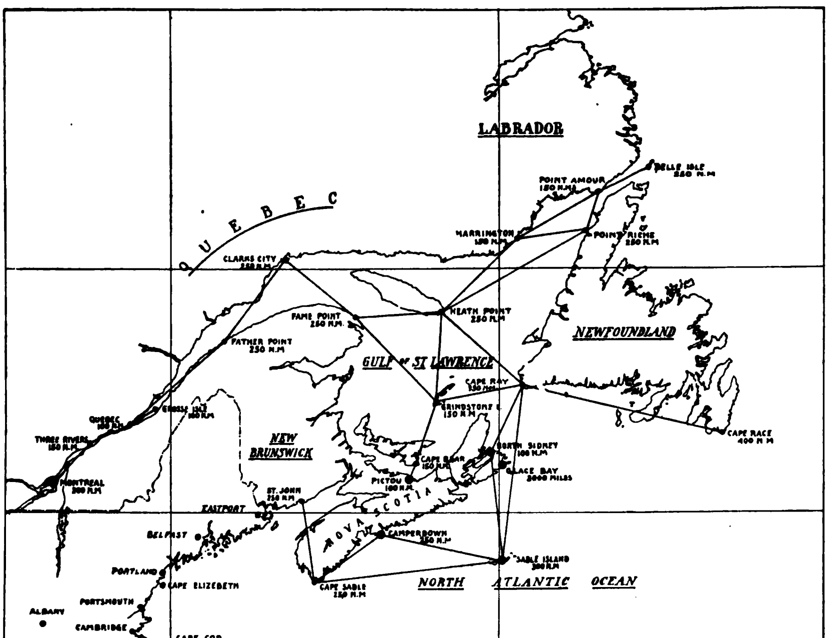
NAVY STATION AT ARLINGTON, VA.
Observed time will be sent out regularly from this station.

WIRELESS STATIONS.

A complete list of wireless telegraph stations of the world, including shore stations, merchant vessels, revenue cutters and vessels of the United States Navy, is published periodically by the Bureau of Steam Engineering of the Department of the Navy. The edition for January 1, 1912, consists of 165 pages. Copies of this publication can be obtained from the Superintendent of Documents, United States Printing Office, Washington, D. C., at a cost of 15 cents. The section devoted to wireless telegraphy in this book as regards the United States is taken from this work and is corrected to June 12, 1912, but many who would like to have the call letters, etc., of foreign wireless shore stations, also the call letters, etc., of vessels of the United States Navy, the United States Army, revenue cutters, and all steamships which are equipped with wireless, should purchase this inexpensive pamphlet. Space forbade the publication of this list in full.

Wireless communication was an established fact for more than ten years before the ships "Republic" and "Florida" collided on January 23, 1909. The wonderful salvage operation which was only rendered possible by the prompt action of the vessel summoned by wireless called instant attention to the importance of wireless as a safeguard from the dangers of the sea. The "Republic" might have gone down to the bottom without news of the disaster and with none of the passengers and crew saved, except possibly a few of them who escaped by life boats, had it not been for this most practical invention. It was two days after "La Bourgoyne" sank before the story of the catastrophe became known. The next interesting use of the wireless was perhaps the detection and arrest of Dr. Crippen for the crime of murder. There is no more weird story in the annals of crime than how the unseen wireless brought Dr. Crippen to the noose. Stations that were practically unknown became suddenly vitalized, and to-day Cape Sable, Belle Isle, Fame Point and Father Point are household words.

On the 14th of April, at 11.46 P. M., ship's time, the "Titanic" struck an iceberg. Within fifteen or twenty minutes the Captain visited the wireless room and instructed the operator to get assistance. The two calls "C.Q.D." and "S.O.S." began to flash from the aerials, and the message of despair from the sinking vessel was heard by the "Mount Temple," the "Frankfurt" and the "Carpathia." The Captain of the "Carpathia" immediately turned around and succeeded in reaching the "Titanic" after she sank, and rescued a portion of her passengers and crew. Had it not been for the wireless the probabilities are that very few, if any, survivors would have remained to tell the awful tale.



WIRELESS STATIONS IN THE UNITED STATES AND CANADA. A GREAT CENTER OF WIRELESS ACTIVITY.

WIRELESS TELEGRAPH SHORE STATIONS OF THE UNITED STATES AND CANADA.

Name and Location of Station.	Call Letters.	Range in Nautical Miles.	Power in Kilowatts.	Wave Length in Meters.	Character of Station.
UNITED STATES.	CALL LETTERS ARE SUBJECT TO CHANGE AND HENCE ARE OMITTED.				
ATLANTIC AND GULF COASTS.					
Eastport, Me.		400–1,000	5	800–1,500	Commercial.
Portland, Me.			4	1,000	Gov. (Navy).
Fort Levitt, Me.			1		Gov. (Army).
Portsmouth, N. H.			2	1,000	Gov. (Navy).
Amesbury, Mass.			2		Experimental.
Cambridge, Mass.			1		Do.
Fort Andrews, Mass.			1		Gov. (Army).
Brant Rock, Mass.			7½ and 100	Variable.	Experimental.
Chatham, Mass.			5	480	Commercial.
Chelsea, Mass.					Experimental.
Boston, Mass.			5	Variable.	Do.
Boston, Mass.			5	1,000	Gov. (Navy).
Boston, Mass.			5	Variable.	Experimental.
Cape Cod, Mass.			5	1,000	Do.
Cape Cod, South Wellfleet[1]					Commercial.
Cape Cod, Mass.			35	1,500	Do.
Siasconsett, Mass.			2	350	Do.
Quincy, Mass.		400–1,000	2	550	Do.
Quincy, Mass.					Private.
Nantucket Shoals Lightship			2	400	Gov. (Navy).
Newport, R. I.			5	1,000	Do.
Providence, R. I.					Commercial.
Point Judith, R. I.			2	325	Do.
Block Island, R. I.			¼	280	Private.
New London, Conn.			5	480	Do.
Sea Gate, N. Y.				350	Do.
Sagaponack, N. Y.			2	350	Do.
Fire Island, N. Y.			7	1,000	Gov. (Navy).
N. Y. (42 Broadway)		180–500	2	350–1,000	Commercial.
N. Y. (111 Broadway)				425	Do.
N. Y. (Wanamaker's)					Private.
N. Y. (Herald, Battery)			2	640	Do.
N. Y.			2	3,000	Experimental.
Brooklyn, N. Y.			15	1,000	Gov. (Navy).
Fort H. G. Wright, N. Y.			1		Gov. (Army).
Fort Totten, N. Y.			1		Do.
Fort Wood, N. Y.			3		Do.
Fort Hancock, N. J.			1		Do.
Atlantic City, N. J.		300–600	2	700	Do.
Cape May, N. J.					Do.
Camden, N. J.		150–500	2	550	Do.
Philadelphia, Pa. (Wanamaker's)					Private.
Philadelphia, Pa. (Bellevue-Stratford)		500	2	550	Commercial.
Philadelphia, Pa.			3	1,000	Gov. (Navy).
Cape Henlopen, Del.			2	1,000	Do.
Sparrows Point, Md.		350	5	750	Commercial.
Annapolis, Md.			2	1,000	Gov. (Navy).
Washington, D. C.			5	1,000	Do.
Washington, D. C.			2		Experimental.
Washington, D. C. (Mills Building)			3		Gov. (Army).
Washington, D. C. (Bureau of Standards)			2		Do.
Arlington, Va.[2]			100		Gov. (Navy).
Fort Monroe, Va.			1		Gov. (Army).
Fort Monroe, Va.			2		Do
Norfolk, Va.		150	2	580	Commercial.
Norfolk, Va.			5	1,000	Gov. (Navy).

[1] High Power Marconi Station.
[2] Under construction three large wireless towers.

WIRELESS TELEGRAPH SHORE STATIONS OF THE UNITED STATES AND CANADA.—Continued.

Name and Location of Station.	Call Letters.	Range in Nautical Miles.	Power in Kilowatts.	Wave Length in Meters.	Character of Station.
ATLANTIC AND GULF COASTS—Continued.	CALL LETTERS ARE SUBJECT TO CHANGE AND HENCE ARE OMITTED.				
Beaufort, N. C.		....	5	1,000	Gov. (Navy).
Diamond Shoals			1	400	Do.
Cape Hatteras, N. C		450–1,000	5	600	Commercial.
Charleston, S. C		....	5	1,000	Gov. (Navy).
Frying Pan Shoals		....	2	400	Do.
Savannah, Ga		150–600	2	450	Commercial.
Jacksonville, Fla		150–300	2	600	Commercial.
St. Augustine, Fla		....	2	1,000	Gov. (Navy).
Jupiter, Fla		....	5	1,000	Do.
Key West, Fla		....	25 and 2	1,000–2,000	Gov. (Navy).
Tampa, Fla		500–1,500	5	600	Commercial.
Pensacola, Fla		....	5	1,000	Gov. (Navy).
Mobile, Ala		....	2	400	Commercial.
Fort Morgan, Ala		100	2	350	Do.
New Orleans, La		300–500	5	500	Do.
New Orleans, La		700	5 and 25	1,750	Private.
New Orleans, La		....	5	1,000	Gov. (Navy).
Burrwood, La		75	1½	250	Private.
Grand Island, La		450–1,000	2	1,000	Commercial.
Port Arthur, Tex		200	2	450	Do.
Port Arthur, Tex		....	....	....	Do.
Galveston, Tex		200–400	2	450	Do.
Fort Sam Houston, Tex.[1]		....	10	....	Gov. (Army).
INTERIOR.					
Fort Leavenworth, Kans		....	3	....	Do.
Fort Riley, Kans		....	3	....	Do.
Fort Omaha, Neb		....	3	....	Do.
GREAT LAKES.					
Buffalo, N. Y		75	2	Variable.	Commercial.
Erie, Pa		....	5	....	Do.
Ashtabula, Ohio		....	5	500	Do.
Cleveland, Ohio		150	2	Variable.	Do.
Cleveland, Ohio		....	10	1,000	Do.
Toledo, Ohio		....	5	....	Do.
Detroit, Mich		150	2	Variable.	Do.
Detroit, Mich		....	....	Variable.	Experimental.
Detroit, Mich		....	5	Variable.	Commercial.
Detroit, Mich		....	5	750	Do.
Port Huron, Mich		....	10	850	Do.
Bay City, Mich		....	5	750	Do.
Saginaw, Mich		....	5	500	Do.
Mackinac Island, Mich		100	2	Variable.	Do.
Ludington, Mich		150	2	Variable.	Do.
Harbor Beach, Mich		....	2	Variable.	Do.
Isle Royal, Mich		....	2	Variable.	Do.
Grand Haven, Mich		100	2	Variable.	Do.
Benton Harbor, Mich		100	2	Variable.	Do.
Chicago, Ill. (Hotel)		150–200	2	Variable.	Do.
Chicago, Ill		....	7½	900	Do.
Milwaukee, Wis		200	5	Variable.	Do.
Manitowoc, Wis		150	2	Variable.	Do.
Waupaca, Wis		....	2	....	Do.
Scandinavia, Wis		....	1	....	Do.
Sault Ste. Marie, Mich		250	5	Variable.	Do.
Marquette, Mich		....	7½	900	Do.
Frankfort, Mich		150	2	Variable.	Do.
Manistique, Mich		150	2	Variable.	Do.
Calumet, Mich		150	2	Variable.	Do.
Duluth, Minn		....	5	Variable.	Do.
Grand Marais, Minn		150	2	Variable.	Do.

[1]Projected.

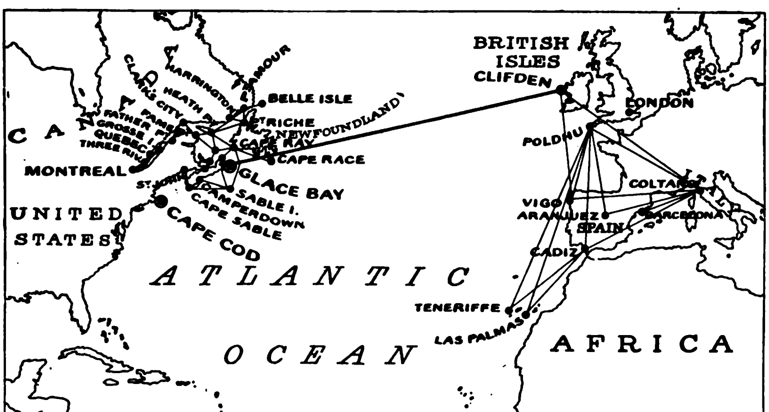
WIRELESS TELEGRAPH SHORE STATIONS OF THE UNITED STATES AND CANADA.—Continued.

Name and Location of Station.	Call Letters.	Range in Nautical Miles.	Power in Kilowatts.	Wave Length in Meters.	Character of Station.
PACIFIC COAST.	CALL LETTERS ARE SUBJECT TO CHANGE AND HENCE ARE OMITTED.				
Friday Harbor, Wash			2		Commercial.
Seattle, Wash			5	1,500	Do.
Seattle, Wash			5	500	Do.
Seattle, Wash			4		Private.
Roche Harbor, Wash			4		Do.
Bremerton, Wash			5	1,000	Gov. (Navy).
Tacoma, Wash			2	400	Commercial.
Tatoosh Island, Wash			5	1,000	Gov. (Navy).
North Head, Ilwaco, Wash			10	1,000	Do.
Fort Worden, Wash			1		Gov. (Army).
Astoria, Oreg		200	2	425	Commercial.
Marshfield, Oreg			2		Do.
Fort Stevens, Oreg			1		Do.
Cape Blanco, Denmark, Ore			5	1,000	Gov. (Navy).
Eureka, Cal			5	425	Commercial.
Eureka, Cal			5	1,000	Gov. (Navy).
Farallon Islands, Cal			5	1,000	Do.
San Francisco, Cal			10	600	Commercial.
S. F., Cal. (Presidio)			1		Gov. (Army).
Yerba Buena Island, S. F.			2	600	Gov. (Navy).
Mare Island, Cal			5	1,000	Do.
San Luis Obispo, Cal			2	100	Commercial.
Point Arguello, Surf, Cal			3	1,000	Gov. (Navy).
San Pedro, Cal			5	425	Commercial.
Los Angeles, Cal			2	425	Do.
Los Angeles, Cal			2	500	Do.
Avalon, Cal			1	500	Do.
Avalon, Cal			2	425	Do.
San Diego, Cal			5	1,000	Gov. (Navy).
ALASKA.					
Pribilof Islands			3	1,000	Gov. (Navy).
Dutch Harbor			5	1,000	Do.
Unalga Island[1]			10	1,000	Do.
Kodiak			3	1,000	Do.
Cordova			10	1,000	Do.
Sitka			20	1,000	Do.
Circle City			3		Do.
Fort Egbert			5		Do.
Fairbanks			5		Do.
Fort Gibbon			10		Do.
Fort St. Michael			3		Do.
Kotlik			1		Do.
Nome			10		Do.
Nulato			10		Do.
Petersburg			1		Do.
Wrangell			1		Do.
Ketchikan			2		Commercial.
Juneau			2		Do.
Karluk			5		Do.
Kogginung			2		Do.
Chignik			2		Do.
Nushagak			2		Do.
Clarks Point			2		Do.
Nak Nek			5		Do.
CANADA.					
Indian Harbor, Labrador					Government.
Domino Island, Labrador		150		220	Do.
American Tickle, Labrador					Do.
Venison Island, Labrador		150		220	Do.
Battle Harbor, Labrador		150		220	Do.

[1]Projected.

WIRELESS TELEGRAPH SHORE STATIONS OF THE UNITED STATES AND CANADA.—Continued.

Name and Location of Station.	Call Letters.	Range in Nautical Miles.	Power in Kilowatts.	Wave Length in Meters.	Character of Station.
CANADA—Continued.					
Chateau Bay, Labrador....	CALL LETTERS ARE SUBJECT TO CHANGE AND HENCE ARE OMITTED.	....	....	....	Government.
Belle Isle, Newfoundland....		230	....	600	Do.
Point Rich, Newfoundland...		230	....	600	Do.
Cape Ray, Newfoundland...		270	....	*600*, 1,600	Do.
Cape Race, Newfoundland....		350	....	*600*, 1,600	Do.
Harrington, Quebec........		135	....	300	Do.
Heath Point, Anticosti Isd..		230	....	600	Do.
Grindstone, Magdalen Isd....		135	....	600	Do.
Fame Point, Quebec........		230	....	600	Do.
Clarke City, Quebec........		230	....	600	Do.
Father Point, Quebec........		230	....	600	Do.
Grosse Isle, Quebec........		100	....	300	Do.
Quebec, Quebec............		100	....	300	Do.
Three Rivers, Quebec......		135	....	600	Commercial.
Montreal, Quebec..........		190	....	600	Do.
North Sydney..............		135	....	300	Do.
Cape Breton, Glace Bay.....		....	....	....	Government.
Pictou, Nova Scotia........		100	....	300	Do.
Camperdown, Nova Scotia..		230	....	600	Commercial.
Sable Island, Nova Scotia...		300	....	600	Government.
Cape Sable, Nova Scotia....		230	....	600	Do.
St. John, Partridge Island...		230	....	600	Do.
Port Arthur, Ontario.......		350	....	600	Do.
St. Thomas, Ontario........		....	5	400	Commercial.
Prince Rupert, B. C.........		250	....	600	Government.
Dead Tree Point, B. C......		225	....	600	Do.
Ikeda Head, B. C..........		250	....	600	Do.
Triangle Island, B. C.......		350	....	600	Do.
Cape Lazo, Vancouver, B. C.		175	....	600	Do.
Estevan, Vancouver, B. C...		100	....	600	Do.
Point Grey, Vancouver, B.C.		100	....	600	Do.
Pachena, Vancouver, B. C..		250	....	600	Do.
Victoria, B. C..............		200	....	600	Do.



COMMERCIAL TELEGRAPH STATIONS CONSTRUCTED BY MARCONI'S WIRELESS TELEGRAPH CO. LTD., AND IN OPERATION.

On June 12, 1912, there were 1,577 merchant ships equipped with wireless telegraph installations. The total number of commercial coast stations was 286.

Under the Imperial Wireless System all of the stations will be fitted with apparatus for the automatic transmission and receipt of messages, guaranteeing a speed of not less than fifty words a minute. Arrangements are progressing and the work will be carried out as expeditiously as possible for the construction of stations placing Great Britain in direct communication with New York, instead of having the messages pass through Glace Bay; also for the construction of stations in San Francisco for communication through the Hawaiian Islands with the Philippines, China and Japan. Arrangements are also being made for stations to send messages from New York south to Cuba, Panama, and subsequently to each South American State.

The New York *Times* has made more use of the wireless station than perhaps any other paper in the world, and nearly all of their foreign news in the Sunday edition is transmitted by wireless. When the new stations in London and New York are completed wireless messages will be received in less than ten minutes from the time of their dispatch, independent between these two points. When the stations are completed the Marconi Company will be independent of land lines and will provide a service which will not be surpassed for speed and accuracy. The world's rights in the wireless compass of Messrs. Bellini and Tosi has also been acquired by the Marconi Company. This will undoubtedly prove of considerable value when worked in conjunction with existing wireless installations aboard ships, enabling the Captain to define the position of an approaching ship or of the land in a dense fog.

The United States Navy is now planning the construction of a chain of wireless stations embracing two oceans and a continent within the range of this chain, so that naval vessels, whether near the African coast or in Chinese waters, will be under direct control from Washington by aerial communication. Funds for this plan were not forthcoming at the last session of Congress. The first section is now in course of erection at Arlington, Va., and will be ready shortly after the publication of this book. Each of the stations is to have a semi-radius of 3,000 miles or more.

The Arlington station consists of three steel towers in the form of an isosceles-triangle. At the apex of the triangle the tower is 650 feet high, or 95 feet higher than the tip of the Washington monument. At the base are two towers, each 450 feet in height. The antennae are to be strung from the tallest tower to the other two. These immense towers are striking features of the landscape as viewed from any point of vantage in Washington. It is contemplated to move all of our naval vessels by the use of these towers. The range of the Arlington station will cover practically all of the North Atlantic ocean. Guantanamo, Cuba, falls easily within the range of this station, and regular communication with the station to be erected at Panama will be had with equal facility

TRANSATLANTIC MARCONIGRAMS.

Marconigrams for transmission to Great Britain and Ireland and to ships at sea are accepted at all offices of the Western Union Telegraph Co. and the Great North-Western Telegraph Co.

The established rules and regulations governing the method of counting and charging of Cable Messages are applicable to Marconigrams.

RATES.

FROM — TO	Great Britain and Ireland
Points in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York City, Yonkers, N. Y., Hoboken, Jersey City Union Hill, N. J., Points in the Maritime Provinces, New Brunswick, Nova Scotia and in the Eastern Canadian Provinces, Quebec and Ontario	$0.15
Delaware, Maryland, New Jersey, (except Hoboken, Jersey City and Union Hill,) New York (except New York City and Yonkers), Pennsylvania and the District of Columbia	.18
Alabama, Georgia, Illinois, Indiana, Kentucky, Michigan, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia, West Virginia and Wisconsin, Pensacola, Fla., Burlington, Clinton, Cedar Rapids, Davenport, Dubuque, Ft. Madison, Keokuk and Muscatine, Ia., New Orleans, La., Duluth, Hastings, Lake City, Minneapolis, Redwing, St. Paul, Stillwater, Wabasha and Winona, Minn., Hannibal, La., St. Louis, Mo.	.21
Arkansas, Colorado, Florida (except Pensacola and Key West), Iowa (except Burlington, Clinton, Cedar Rapids, Davenport, Dubuque, Ft. Madison, Keokuk, and Muscatine), Kansas, Louisiana (except New Orleans), Manitoba, Minnesota (except Duluth, Hastings, Lake City, Minneapolis, Redwing, St. Paul, Stillwater, Wabasha and Winona), Missouri (except Hannibal, Louisiana and St. Louis), Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Wyoming	.24
Arizona, California, Idaho, Nevada, Oregon, Utah and Washington, Key West, Fla., Vancouver, Victoria and New Westminster, B. C.	.27

Deferred messages subject to a maximum delay of 24 hours and written in plain English language are also accepted at one-half these rates.

WIRELESS WORD RATES / TO STEAMSHIPS VIA	N. Y. City or Sea Gate, N. Y.	Sayville, N. Y.	Boston, Mass.	Siasconset, Mass., check Woods Hole.	Cape May, N. J.	Philadelphia, Pa.	Baltimore, Md.	Hatteras, N. C., check Norfolk, Va.	Charleston, S. C., or Charleston Navy Yard, check Charleston.	Savannah, Ga.	Jacksonville or Tampa, Flo.	Pensacola or St. Augustine, Flo.	Mobile, Ala.	New Orleans, La.	Grand Isl., La., check New Orleans.	Galveston or Port Arthur, Tex.	San Francisco, Cal.	Seattle, Wn., Astoria, Ore., Point Grey or Victoria, B. C.
For Trans. Ocean Vessels	20	20	20	28	20	20											20	20
For Coastwise Vessels	10‡	10‡	10‡	15‡	10‡	10‡	10‡	11‡	10‡	10‡	10‡	10‡	10‡	10‡	17‡	10‡	10‡	10‡
To the above wireless rates add land line rate below																		
Alabama	06	06	06	06	06	06	06	05	05	05	05	05	03	05	05	05	10	10
Alaska	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	40	38	35
Alberta	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	08	06
Arizona	10	10	10	10	10	10	10	10	10	08	10	10	08	08	08	08	06	08
Arkansas	06	06	06	06	06	06	06	06	06	05	05	05	05	05	05	05	10	10
British Columbia	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	06	05
California	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	08	04	06
Colorado	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	06	08	08
Connecticut	02	02	02	02	04	04	04	05	06	06	06	06	06	06	06	08	10	10
Delaware	03	03	04	04	04	02	02	04	05	06	06	06	06	06	06	08	10	10
District of Columbia	03	03	04	04	04	02	02	04	05	05	06	06	06	05	05	08	10	10
Florida	06	06	06	06	06	06	06	05	05	05	04	04	05	05	05	06	10	10
Georgia	06	06	06	06	06	06	05	05	05	02	05	05	05	05	05	06	10	10
Idaho	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	08	06	05
Illinois	05	05	06	06	05	05	05	05	06	06	06	06	06	06	06	06	08	08
Indiana	05	05	05	05	05	05	05	05	06	06	06	06	06	06	06	06	10	10
Iowa	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	08	08
Kansas	06	06	08	08	06	06	06	06	08	06	08	08	06	06	06	08	08	08
Kentucky	05	05	06	06	05	05	05	05	05	05	05	05	05	05	05	06	10	10
Labrador	12	12	12	12	12	12	12	13	13	15	15	15	15	15	15	15	17	17
Louisiana	06	06	06	06	06	06	06	05	05	05	05	05	05	02	02	05	10	10
Maine	04	04	03	03	05	05	05	05	06	06	06	06	06	06	06	08	10	10
Manitoba	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	10	08
Maryland	03	03	05	05	04	03	02	04	05	05	06	06	06	06	06	08	10	10
Massachusetts	03	03	02	02	04	04	04	05	06	06	06	06	06	06	06	08	10	10
Michigan	05	05	05	05	05	05	05	05	06	06	06	06	06	06	06	08	10	10
Minnesota	06	06	06	06	06	06	06	06	08	08	08	08	08	08	08	08	08	08
Mississippi	06	06	06	06	06	06	06	05	05	05	05	05	05	04	04	05	10	10
Missouri	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	08	08
Montana	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	06
Nebraska	06	06	08	08	06	06	06	06	08	08	08	08	08	08	08	06	08	08
Nevada	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	08	05	06
New Brunswick	05	05	05	05	05	05	05	06	06	08	08	08	08	08	08	08	10	10
Newfoundland	11	11	11	11	11	11	11	12	12	14	14	14	14	14	14	14	16	16
New Hampshire	03	03	03	03	04	04	04	05	06	06	06	06	06	06	06	08	10	10
New Jersey	02	02	04	04	02	02	04	05	06	06	06	06	06	06	06	08	10	10
New Mexico	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	06	08	08
New York City	02	02	03	03	02	02	03	05	06	06	06	06	06	06	06	08	10	10
New York	03	03	04	04	04	04	04	05	06	06	06	06	06	06	06	08	10	10
North Carolina	05	05	06	06	05	05	05	05	05	05	05	05	05	05	05	06	10	10
North Dakota	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08
Nova Scotia	05	05	05	05	05	05	05	06	06	08	08	08	08	08	08	08	10	10
Ohio	04	04	05	05	04	04	04	05	06	06	06	06	06	06	06	06	10	10
Oklahoma	08	08	08	08	08	08	08	08	08	06	08	08	06	05	05	05	08	08
Ontario, Sec. 1	05	05	05	05	05	05	05	06	08	08	08	08	08	08	08	08	10	10
" Sec. 2, 3	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	10	10
" Sec. 4	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Oregon	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	08	05	05
Philadelphia	02	02	04	04	02	02	02	05	05	06	06	06	06	06	06	08	10	10
Pennsylvania	03	03	04	04	04	03	04	05	06	06	06	06	06	06	06	08	10	10
Prince Edward Island	07	07	07	07	07	07	07	08	08	10	10	10	10	10	10	10	12	12
Quebec	05	05	05	05	05	05	05	06	08	08	08	08	08	08	08	08	10	10
Rhode Island	03	03	02	02	04	04	04	05	06	06	06	06	06	06	06	08	10	10
Saskatchewan	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	09
South Carolina	06	06	06	06	06	05	05	05	02	05	05	05	05	05	05	06	10	10
South Dakota	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08
Tennessee	05	05	06	06	05	05	05	05	05	05	05	05	05	05	05	06	10	10
Texas	08	08	08	08	08	08	08	08	06	06	06	06	05	05	05	03	08	08
Utah	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	06	06
Vermont	03	03	03	03	04	04	04	05	06	06	06	06	06	06	06	08	10	10
Virginia	04	04	05	05	05	05	04	02	05	05	05	05	05	05	05	08	10	10
Washington	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	08	06	03
West Virginia	04	04	05	05	04	04	04	04	05	05	06	06	06	06	06	08	10	10
Wisconsin	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	08	08	08
Wyoming	08	08	03	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08
Yukon	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	48	47

‡ The wireless rate for coastwise vessels of the Booth, Lamport and Holt, Quebec Royal Mail Steam Packet and United Fruit Co. lines, is 14 cents per word, from all shore stations in the United States.

WIRELESS WORD RATES / TO STEAMSHIPS VIA	Friday Harbor, Wn., check Bellingham.	Quebec, Three Rivers or Montreal, Que.	Camperdam, N. S., check Halifax * or St. John, N. B.*	Pictou, N. S.†	Sable Isl., N. S., check Halifax, Cape Race, Nfd.	Cape Bear, P.E.I.,† check Sackville, N. B.	Cape Ray, Nfd.	Brooklyn, N. Y.††	New London, Conn.††	Buffalo, N. Y.	Ashtabula or Cleveland, Ohio.	Detroit, Mich.	Grand Marais, Minn., check Duluth.	Benton Harbor, or Ludington, Mich.	Chicago, Ill.	Milwaukee, Wis.
For Trans. Ocean Vessels	24‡				31											
For Coastwise Vessels	14‡	05	10	05		07	16	06	06	05	05	05	10	05	05	05
	To the above wireless rates add land line rate below															
Alabama	10	08	08	08	08	08	08	06	06	06	06	06	06	06	06	06
Alaska	35	42	42	42	42	42	42	42	42	42	42	42	40	42	40	40
Alberta	06	09	09	09	00	09	09	10	10	10	10	10	08	10	08	08
Arizona	08	10	10	10	10	10	10	10	10	10	10	10	10	10	08	10
Arkansas	10	08	08	08	08	08	08	06	06	06	06	06	06	06	05	05
British Columbia	05	10	10	10	10	10	10	10	10	10	10	10	08	10	08	08
California	06	10	10	10	10	10	10	10	10	10	10	10	08	10	08	08
Colorado	08	08	08	08	08	08	08	08	08	08	08	08	06	08	06	06
Connecticut	10	05	05	05	05	05	05	02	02	04	05	05	06	05	05	06
Delaware	10	05	05	05	05	05	05	03	04	04	04	04	06	04	05	06
District of Columbia	10	05	05	05	05	05	05	03	04	04	04	04	06	04	05	05
Florida	10	08	08	08	08	08	08	06	06	06	06	06	06	06	06	06
Georgia	10	08	08	08	08	08	08	06	06	06	06	06	06	06	06	06
Idaho	05	10	10	10	10	10	10	10	10	10	10	10	08	10	08	08
Illinois	08	06	08	08	08	08	08	05	06	05	05	05	05	05	04	05
Indiana	10	05	06	06	06	06	06	05	05	04	04	04	05	05	04	05
Iowa	08	08	08	08	08	08	08	06	06	05	05	05	05	05	05	05
Kansas	08	08	08	08	08	08	08	06	08	06	06	06	06	06	05	05
Kentucky	10	06	06	06	06	06	06	05	06	05	05	05	05	05	05	05
Labrador	17	10	09	09	09	08	09	12	12	12	13	13	15	13	13	15
Louisiana	10	08	08	08	08	08	08	06	08	06	06	06	08	06	06	08
Maine	10	04	04	04	04	04	04	04	04	05	05	05	06	05	06	06
Manitoba	08	08	08	08	08	08	08	08	08	08	08	06	05	06	05	05
Maryland	10	05	05	05	05	05	05	03	04	04	04	04	06	05	05	05
Massachusetts	10	05	05	05	05	05	05	03	03	04	05	05	06	05	05	06
Michigan	10	05	06	06	06	06	06	05	05	04	05	05	05	04	04	05
Minnesota	08	08	08	08	08	08	08	06	06	06	06	05	04	05	05	05
Mississippi	10	08	08	08	08	08	08	06	06	06	06	06	06	06	06	06
Missouri	08	08	08	08	08	08	08	06	06	05	05	05	05	05	05	05
Montana	06	08	08	08	08	08	08	08	08	08	08	08	06	08	08	06
Nebraska	08	08	08	08	08	08	08	06	08	06	06	06	05	06	05	05
Nevada	06	10	10	10	10	10	10	10	10	10	10	10	08	10	06	08
New Brunswick	10	03	02	02	02	01	02	05	05	05	06	06	08	06	06	08
Newfoundland	16	09	08	08	08	07	08	11	11	11	12	12	14	12	12	14
New Hampshire	10	04	05	05	05	05	05	03	04	04	05	05	06	05	06	06
New Jersey	10	05	05	05	05	05	05	02	04	04	04	04	06	05	05	05
New Mexico	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08	08
New York City	10	05	05	05	05	05	05	02	04	04	04	04	06	05	05	05
New York	10	05	05	05	05	05	05	03	04	04	04	04	06	05	05	05
North Carolina	10	06	06	06	06	06	06	05	06	05	05	05	06	05	06	06
North Dakota	08	08	08	08	08	08	08	08	08	08	06	06	05	06	06	05
Nova Scotia	10	03	02	02	02	01	02	05	05	05	06	06	08	06	06	08
Ohio	10	05	06	06	06	06	06	04	05	04	03	04	05	05	04	05
Oklahoma	08	08	08	08	08	08	08	08	08	08	06	06	06	06	06	06
Ontario, Sec. 1	10	03	03	03	03	03	03	05	05	04	05	04	06	05	05	05
" Sec. 2, 3	10	06	06	06	06	06	06	08	08	08	08	06	05	06	05	05
" Sec. 4	10	06	06	06	06	06	06	10	10	10	10	09	08	09	10	09
Oregon	05	10	10	10	10	10	10	10	10	10	10	10	08	10	08	08
Philadelphia	10	05	05	05	05	05	05	02	04	04	04	04	06	05	05	05
Pennsylvania	10	05	05	05	05	05	05	03	04	04	04	04	06	05	05	05
Prince Edward Island	12	03	03	03	03	01	03	07	07	07	08	08	10	08	08	10
Quebec	10	03	03	03	03	03	03	05	05	05	05	05	06	05	05	05
Rhode Island	10	05	05	05	05	05	05	03	03	04	05	05	06	05	05	06
Saskatchewan	09	09	09	09	09	09	09	10	10	10	10	10	08	10	08	08
South Carolina	10	08	06	06	06	06	06	06	06	06	06	03	06	06	06	06
South Dakota	08	08	08	08	08	08	08	08	08	08	06	06	05	06	06	06
Tennessee	10	08	08	08	08	08	08	05	06	05	05	05	06	05	05	05
Texas	08	08	08	08	08	08	08	08	08	08	06	08	08	08	06	08
Utah	06	08	10	10	10	10	10	08	08	08	08	08	08	08	08	08
Vermont	10	04	05	05	05	05	05	03	04	04	05	05	06	05	06	06
Virginia	10	06	06	06	06	06	06	04	05	05	05	05	06	05	05	05
Washington	03	10	10	10	10	10	10	10	10	10	10	10	08	10	08	08
West Virginia	10	05	06	06	06	06	06	04	05	04	04	04	06	05	06	06
Wisconsin	08	06	08	08	08	08	08	06	06	05	05	05	04	05	04	04
Wyoming	08	08	08	08	08	08	08	08	08	08	08	08	06	08	05	05
Yukon	47	52	52	52	52	52	52	52	52	52	52	52	50	52	50	50

*** For steamers bound to Canadian Ports. † For steamers in Northumberland Straits.**

†† For Sound steamers of the Montauk Steamboat Co., and the Fall River, New Bedford, Providence and Colonial Lines only.

‡ The wireless rate for coastwise vessels of the Booth, Lamport and Holt, Quebec, Royal Mail Steam Packet and United Fruit Co. lines is 14 cents per word, from all shore stations in the United States.

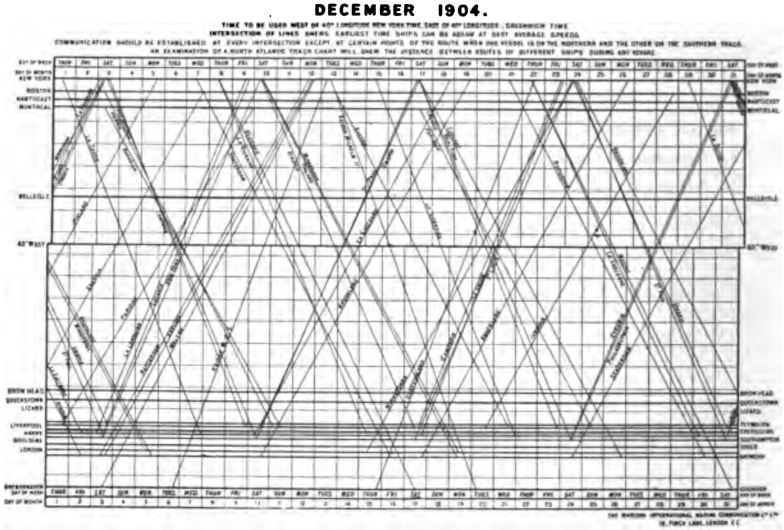
WIRELESS WORD RATES / TO STEAMSHIPS VIA	Calumet, Mich.	Manistique, Mich.	Duluth, Minn.	S. S. Marie, Ont.	Port Arthur, Ont.	Kingston, Toronto, Sarnia, Pt. Colborne, Ont.	Cape Elizabeth, Me., check Portland, Me.	Portsmouth Navy Yard, N. H.	Newport, R. I.	Washington, D. C.	Tatoosh Island, Wa., check Port Crescent	San Diego, Calif.
For Trans. Ocean Vessels											21‡	20‡
For Coastwise Vessels	05	07	05	05	05	05	11‡	10‡	10‡	10‡	11‡	10‡
To the above wireless rates add land line rate below												
Alabama	08	08	06	08	10	08	06	06	06	06	10	10
Alaska	42	42	40	42	42	42	42	42	42	42	35	38
Alberta	10	10	08	09	09	09	10	10	10	10	06	08
Arizona	10	10	10	10	10	10	10	10	10	10	08	06
Arkansas	06	06	06	06	10	08	06	06	06	06	10	10
British Columbia	10	10	08	10	10	10	10	10	10	10	05	06
California	10	10	08	10	10	10	10	10	10	10	06	04
Colorado	08	08	06	08	10	08	08	08	08	08	08	08
Connecticut	06	06	06	06	10	05	04	04	02	04	10	10
Delaware	06	06	06	06	10	05	05	05	04	02	10	10
District of Columbia	06	06	06	06	10	05	04	04	04	02	10	10
Florida	08	08	06	08	10	08	06	06	06	06	10	10
Georgia	08	08	06	08	10	08	06	06	06	05	10	10
Idaho	08	08	08	08	10	10	10	10	10	10	05	06
Illinois	05	05	05	05	10	06	06	06	06	05	08	08
Indiana	05	05	05	05	10	05	05	05	05	05	10	10
Iowa	05	05	05	05	10	08	06	06	06	06	08	08
Kansas	06	06	06	06	10	08	08	08	08	06	08	08
Kentucky	05	05	05	05	10	06	06	06	06	05	10	10
Labrador	13	13	15	13	13	09	12	12	12	12	17	17
Louisiana	08	08	08	08	10	08	08	08	06	06	10	10
Maine	06	06	06	06	10	04	02	03	03	05	10	10
Manitoba	06	06	05	06	04	08	08	08	08	08	08	10
Maryland	06	06	06	06	10	05	05	05	05	02	10	10
Massachusetts	06	06	06	06	10	05	03	03	02	04	10	10
Michigan	04	04	05	04	09	05	05	05	05	05	10	10
Minnesota	05	05	04	05	08	08	06	06	06	06	08	08
Mississippi	08	08	06	08	10	08	06	06	06	06	10	10
Missouri	05	05	05	05	10	08	06	06	06	06	08	08
Montana	08	08	06	08	10	08	08	08	08	08	06	08
Nebraska	06	06	05	06	10	08	08	08	08	06	08	08
Nevada	10	10	08	10	10	10	10	10	10	10	06	05
New Brunswick	06	06	08	06	06	03	05	05	05	05	10	10
Newfoundland	12	12	14	12	14	08	11	11	11	11	16	16
New Hampshire	06	06	06	06	10	04	03	02	03	04	10	10
New Jersey	06	06	06	06	10	04	04	04	04	03	10	10
New Mexico	08	08	08	08	10	08	08	08	08	08	08	08
New York City	06	06	06	06	10	05	03	03	03	03	10	10
New York	06	06	06	06	10	05	04	04	04	04	10	10
North Carolina	06	06	06	06	10	06	06	06	06	05	10	10
North Dakota	06	06	05	06	09	08	08	08	08	08	08	08
Nova Scotia	06	06	08	06	06	03	05	05	05	05	10	10
Ohio	05	05	05	05	10	05	05	05	05	04	10	10
Oklahoma	08	08	06	08	10	08	08	08	08	08	08	08
Ontario, Sec. 1	05	05	06	05	06	03	05	05	05	05	10	10
" Sec. 2, 3	06	06	05	03	05	06	08	08	08	08	10	10
" Sec. 4	09	09	08	05	03	06	10	10	10	10	10	10
Oregon	10	10	08	10	10	10	10	10	10	10	05	05
Philadelphia	06	06	06	06	10	05	04	04	04	02	10	10
Pennsylvania	06	06	06	06	10	05	05	05	04	04	10	10
Prince Edward Island	08	08	10	06	06	03	06	07	07	07	12	12
Quebec	06	06	06	06	06	03	04	04	05	05	10	10
Rhode Island	06	06	06	06	10	05	04	04	02	04	10	10
Saskatchewan	10	10	08	09	08	09	10	10	10	10	09	10
South Carolina	08	08	06	08	10	08	06	06	06	05	10	10
South Dakota	06	06	05	06	09	08	08	08	08	08	08	08
Tennessee	06	06	06	06	10	08	06	06	06	05	10	10
Texas	08	08	08	08	10	08	08	08	08	08	08	08
Utah	08	08	08	08	10	08	08	08	08	08	06	05
Vermont	06	06	06	06	10	04	03	02	03	04	10	10
Virginia	06	06	06	06	10	06	05	05	05	03	10	10
Washington	10	10	08	10	10	10	10	10	10	10	03	06
West Virginia	05	05	06	05	10	05	05	05	05	04	10	10
Wisconsin	05	05	04	05	09	06	06	06	06	06	08	08
Wyoming	08	08	06	08	10	08	08	08	08	08	08	08
Yukon	52	52	50	52	50	52	52	52	52	52	47	48

‡ The wireless rate for coastwise vessels of the Booth, Lamport and Holt, Quebec, Royal Mail Steam Packet and United Fruit Co. lines, is 14 cents per word from all shore stations in the United States.

MARCONI TELEGRAPH

COMMUNICATION CHART.

DECEMBER 1904.



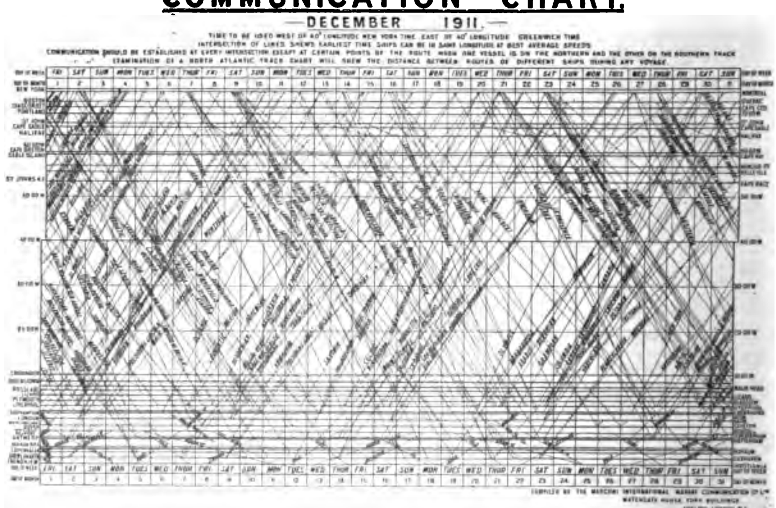
AN EARLY WIRELESS CHART

NORTH ATLANTIC

MARCONI TELEGRAPH.

COMMUNICATION CHART.

DECEMBER 1911.



SEVEN YEARS LATER THE INTERLACING LINES SHOW POSSIBLE INTERCOMMUNICATIONS WHICH HAVE ROBBED THE SEA OF MANY OF ITS TERRORS.

PHENOMENAL INCREASE IN WIRELESS ACTIVITY.

CHAPTER XI.

TELEPHONE STATISTICS OF THE WORLD.

There were approximately 12,453,000 telephones and 29,566,000 miles of telephone wire in use in the world January 1, 1912. A careful estimate places the world's telephone investment January 1, 1912, at about $1,729,000,000 which is very nearly the value of all gold coin and bullion in the United States. The annual number of telephone conversations may be placed at 22,000,000,000, which is about five times the annual number of passengers carried by all the railroads of the world.

For the purpose of this compilation the world's telephone statistics are generally tabulated in four territorial divisions, as follows:

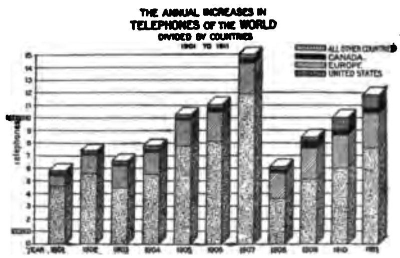
	Telephones Jan. 1, 1912			Wire Jan. 1, 1912		
	Number (partly estimated)	Increase over Jan. 1, 1911	Per cent to Total	Miles (partly estimated)	Increase over Jan. 1, 1911	Per cent to Total
United States	8,362,000	10%	67.1%	18,179,000	9%	61.5%
Canada	335,000	18%	2.7%	788,000	11%	2.6%
Europe	3,239,000	9%	26.0%	9,461,000	8%	32.0%
All other countries	517,000	21%	4.2%	1,138,000	32%	3.9%
Total	12,453,000	10%	100.0%	29,566,000	9%	100.0%

The geographical distribution of telephones and wire is shown below:

	Number of Telephones (Partly Estimated)			Miles of Wire (Partly Estimated)		
	Jan. 1, 1912	Jan. 1, 1911	Increase	Jan. 1, 1912	Jan. 1, 1911	Increase
North America	8,729,000	7,907,000	822,000	19,037,000	17,401,000	1,636,000
South America	120,000	86,000	34,000	233,000	137,000	96,000
Europe	3,239,000	2,966,000	273,000	9,461,000	8,762,000	699,000
Asia	166,000	149,000	17,000	358,000	288,000	70,000
Africa	41,000	34,000	7,000	144,000	128,000	16,000
Australasia	124,000	110,000	14,000	265,000	212,000	53,000
Oceanica	17,000	8,000	9,000	43,000	15,000	28,000
West Indies	17,000	12,000	5,000	25,000	19,000	6,000
Total	12,453,000	11,272,000	1,181,000	29,566,000	26,962,000	2,604,000

The year 1911 is the thirty-fifth since the invention of the telephone by Prof. Alexander Graham Bell. A survey of the progress of telephone service during the past year, and of the many notable events in connection with this progress, justifies the statement that all civilized nations have awakened to the value of the telephone in commercial and social life.

In the United States commercial service has been opened between New York and Denver, 2,160 miles, this being now the longest distance over which oral communication is given commercially. In Europe long distance service has been greatly extended by utilizing both the new loaded cable between Great Britain and Belgium—by which telephone service is expected to be given between London and Berlin—and the new telephone cable, constructed also on the Pupin principle, between Dover and Calais. The latter enables conversation to be carried on between Glasgow, Edinburgh and Paris, and also between Aberdeen and the French capital, a distance of 910 miles. Successful trials have also been made between London and Geneva, a distance of 560 miles, and from London to Bâle, a distance of 600 miles.



Recent progress in the art of submarine telephone cable manufacture will have far reaching consequences. At the present time there are over 400 miles of submarine telephone cable in use in the world, and of this total about one-half is represented by the four cables between France and England, and the two between Belgium and England. The longest submarine telephone cable lies between La Panne (Belgium) and St. Margaret's Bay (England), a distance of 55 miles.

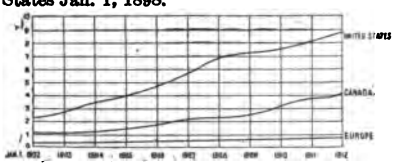
The European international long distance land line systems have likewise received important additions, due to the opening of the line between Paris and Madrid, 900 miles, and the direct line between Berlin and Rome still under construction, a distance of over 1,000 miles. As regards the Continent, there is now scarcely any important city that cannot talk with any other important city. By far the largest interurban or toll telephone plant in Europe has been built by the German Government, which according to the latest official statistics, had about one-half of the total interurban or toll telephone wire of Europe.

Finally, it is worthy of note that during the year 1911 the great United States railway systems have made rapid advances toward the general use of the telephone for train dispatching. Since the introduction of the use of the telephone for that purpose, over 200 of the United States railroads have adopted that system. In fact, the telephone has supplanted the telegraph on over 50,000 miles of railroad, which is over 20% of the total railroad mileage of the country. A careful estimate places the miles of wire used by railroad companies for train dispatching at 120,000, and the corresponding number of telephones at 10,000.

Considering telephones per 100 population and referring only to the United States, Canada and Europe, the following chart shows their respective condition during the past ten years. At the beginning and end of the period the exact figures are:

	United States	Canada	Europe
Jan. 1, 1902......	2.3	1.2	0.3
Jan. 1, 1912......	8.8	4.2	0.7

From this it appears that it takes Europe about two years to advance 0.1. Assuming that European telephone progress continues at this rate, to reach the present development of the United States (8.8), Europe must gain 8.1, which at the rate of 0.1 every two years would require 162 years. As such a forecast makes no allowance for the impetus in future progress due to the use of rates better adapted to the needs of the public and important advances in the art, the above period will be shortened materially. One thing, however, is certain: Europe offers yet a vast field for telephone progress, because at the beginning of 1912 it has reached only the development of the United States Jan. 1, 1898.



TELEPHONES PER 100 POPULATION UNITED STATES, CANADA AND EUROPE, 1902 TO 1912.

It is worthy of note that the United States, Jan. 1, 1912, had over one-half the total telephone wire of the world, and nearly twice the total mileage of Europe, while the latter at the same date had almost the same telephone wire mileage as the United States had at Jan. 1, 1907. The pronounced increase in the wire mileage of "all other countries" is largely due to more accurate information.

The combined number of telephone conversations of the rest of the world is but one-half that of the United States. The telegraph traffic of the United States presents quite a contrast. Placing the world's telegraph traffic during 1910 at about 579,000,000, the United States took but 17% of the total, while Europe had 62%. In other words, Europe has about the same proportion of the world's telegraph traffic as the United States has of the world's telephone traffic.

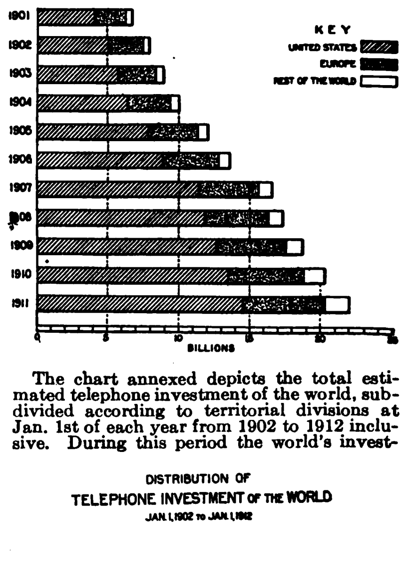
Going back to the first authentic publication of telephone traffic in the United States (1883) the total number of telephone conversations was estimated to be 217,000,000. During the intervening twenty-eight years the United States traffic has reached, as shown above, the colossal total of over fourteen billion, an increase of 6500%, or an average annual increase of 232%.

The annual increases, both in the telephone and telegraph traffic and in the wire plant of the world are shown on the chart on page 315, covering the period 1900-1910. The curves represent the percentage increases over the traffic during 1900 and mileages at the end of the year 1900.

Referring first to the traffic curves, the telephone has gained 277% and the telegraph 36%. In other words, the percentage increase in telephone traffic is about eight times that in telegraph traffic. During the same period the increase in wire plant was 448% for the telephone as compared with 57% for the telegraph, so that the percentage increase in telephone wire is also approximately eight times that of telegraph wire.

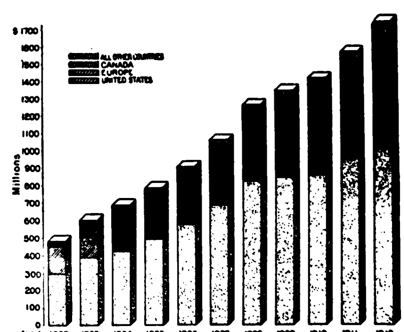
The following chart depicts the telephone conversations of the world for the years 1901 to 1911 inclusive, for the United States, Europe, and all other countries, and shows the proportion of each to the total.

TELEPHONE CONVERSATIONS OF THE WORLD
COMPARING THE UNITED STATES, EUROPE AND THE REST OF THE WORLD
1901 TO 1911 incl.



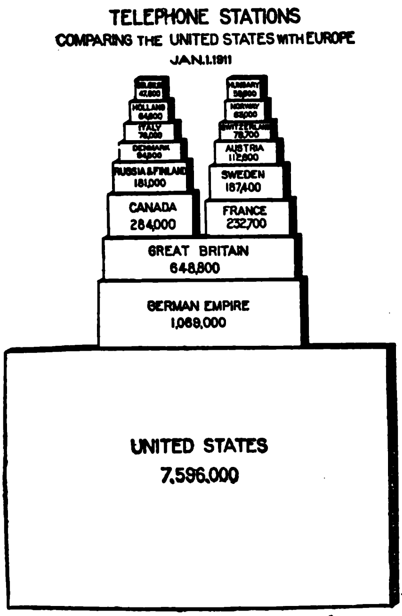
The chart annexed depicts the total estimated telephone investment of the world, subdivided according to territorial divisions at Jan. 1st of each year from 1902 to 1912 inclusive. During this period the world's invest-

DISTRIBUTION OF
TELEPHONE INVESTMENT OF THE WORLD
JAN. 1, 1902 TO JAN. 1, 1912



ment almost quadrupled, increasing from $482,000,000 to $1,729,000,000. Over one-half of this enormous increase was in the United States, where the annual increase averaged approximately $66,000,000. This was about $27,000,000 more than the corresponding average increase in Europe. At the commencement of the year 1912 the total estimated investment in the United States ($1,025,000,000) was about twice that in all Europe ($593,000,000) and was over one-half the investment of the whole world. At the same date Canada is estimated to have $44,000,000 invested in telephones and "all other countries" $67,000,000.

Relative Telephone Development in Various Countries, Jan. 1, 1911.



Telephones in Use.

The statistical table shows the telephone development of the world January 1, 1911. At that date the United States had 67.4% of the total telephones, Europe had 26.3%, Canada 2.5%, thus leaving but 3.8% for all other countries. The high percentage increase during 1910 for Bosnia, Greece and Servia, is due to the fact that these countries are just beginning to be developed.

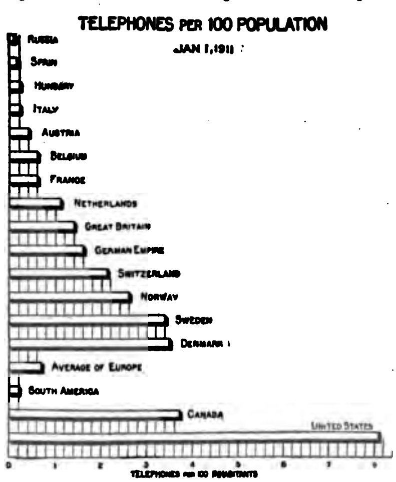
The table shows, that, as in former years, the German Empire and Great Britain remain the leaders in European telephone development, the German Empire having about 36% and Great Britain 22% of all European telephones. Of the remaining countries, only one, France, exceeds 200,000 telephones, and only three others—Austria, Russia and Sweden—

TELEPHONE DEVELOPMENT OF THE WORLD, JANUARY 1, 1911

Division	Telephones January 1, 1911.	Increase during 1910		Per cent of Total	Telephones per 100 Population	Population per Sq. Mile
		Number	%			
United States	7,395,938	600,246	8.6	67.4	8.1	30
Canada	284,373	45,184	18.8	2.5	3.7	4.7
Europe:—						
Austria	112,604	16,764	17.5	1.0	0.4	246
Belgium	47,648	4,907	11.5	0.4	0.6	663
Bosnia	747	151	25.3	..	0.04	96
Bulgaria	2,303	253	12.3	..	0.05	116
Denmark	94,531	7,095	8.1	0.9	3.5	182
Finland	30,478	..	..	0.3	1.0	21
France	232,743	21,079	9.9	2.0	0.6	190
German Empire...	1,068,849	100,748	10.4	9.5	1.6	310
Great Britain	648,832	45,235	7.5	5.8	1.4	371
Greece	1,792	290	19.3	.	0.06	107
Hungary	58,506	7,481	14.6	0.5	0.2	167
Italy	70,139	7,873	12.6	0.6	0.2	312
Luxembourg	3,334	220	7.0	.	1.3	257
Netherlands	64,620	6,207	10.6	0.6	1.1	464
Norway	63,000	5,647	9.8	0.6	2.6	19
Portugal	6,765	451	7.1	..	0.1	155
Roumania	15,000	812	5.7	0.1	0.2	137
Russia	150,850	20,377	15.6	1.3	0.1	67
Servia	2,635	1,075	68.9	..	0.1	155
Spain	25,000	196	0.8	0.2	0.13	99
Sweden	187,441	13,386	7.7	1.6	3.4	32
Switzerland	78,736	4,978	6.7	0.7	2.1	236
Total	2,966,553	266,225	9.8	26.3	0.7	119
South America	85,744	13,642	18.9	0.8	0.2	6.5
All other countries..	339,285	92,671	37.6	3.0	0.03	28
Total World	11,271,893	1,016,968	9.9	100.0	0.6	30

have over 100,000 telephones each. The combined number of telephones in six important European States—Belgium, Norway, Denmark, Hungary, Italy, and the Netherlands—is still less than the number of telephones in New York City, while Chicago has more telephones than France, and Boston more than Austria; the three Scandinavian kingdoms combined do not equal the total number of telephones in New York City by about 57,000.

The following chart presents graphically the statistics shown in the above table in the column "Telephones per 100 Population." Despite considerable activity in some European



countries, the relative positions have not changed during the past year. Denmark still leads Sweden by a small margin. As the average for Europe January 1, 1911, was 0.7 telephones per 100 population, the development of the United States at the same date—8.1 per

100 population—was almost twelve times that of Europe. South America advanced to 0.2 telephones per 100, and Canada to 3.7, or more than five times the development of Europe.

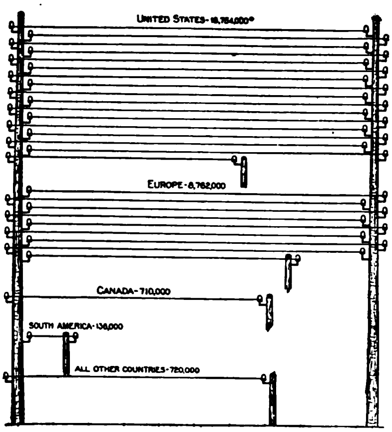
Looking at the telephone development from the point of population per station, it appears that the United States January 1, 1911, averaged one station to each 12 inhabitants, as against the European average of one to 148. Of the European States, Denmark and Sweden are about equal, the former having one station to every 28, and the latter one station to every 29 inhabitants. The German Empire and Great Britain have about twice, France six times and Austria eight times the population per station of Sweden.

In actual number of telephones, Jan. 1, 1911 Berlin, London and Paris, with a combined total of 403,500 telephones, are about even with New York (402,000). The latter approximates very nearly the combined telephones of 14 European States.

Wire Mileage.

The next statistical table and chart view the telephone development of the world in point of wire plant January 1, 1911. At date the grand total of telephone wire mileage was about 27,000,000, of which the United States possessed 61.7%, Europe 32.5%, Canada 2.6%, South America 0.5% and all other countries 2.7%. Thus the United States has almost twice the total telephone wire of all Europe. The German Empire, though possessing the largest number of telephones of any of the European States, has but one-fifth the telephone wire of the United States, and Great Britain but one-eighth.

TELEPHONE WIRE MILEAGE OF THE WORLD
JAN. 1st 1911
27,082,000 MILES

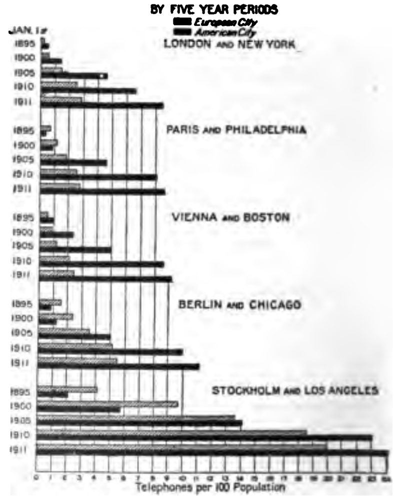


Each full Strand of Wire represents 1,000,000 Miles.

MILES OF TELEPHONE WIRE

Division	Miles of Wire Jan. 1, 1911	Increase during 1910		Per cent of Total Jan. 1, 1911
		Miles	%	
United States	16,633,390	1,383.141	9.0%	61.7
Canada	709,708	102,960	16.9	2.6
Europe:—				
Austria	287,523	31,179	12.1	1.0
Belgium	147,252	9,076	6.5	0.6
Bosnia	1,403	95	7.2	.
Bulgaria	5,762	523	10.0	..
Denmark	254,989	29,837	13.2	0.9
Finland	76,793	6,982	10.0	0.3
France	831,169	93,527	12.7	3.0
German Empire	3,553,504	329,027	10.2	13.2
Great Britain	2,116,368	91,420	4.5	7.9
Greece	5,323	1,064	24.0	..
Hungary	201,636	22,604	12.6	0.8
Italy	161,628	14,693	10.0	0.6
Luxembourg	3,612	62	1.7	..
Netherlands	141,478	19,082	15.6	0.5
Norway	129,168	8,383	6.9	0.5
Portugal	21,114	1,858	9.6	
Roumania	45,333	4,175	10.0	
Russia	260,049	18,630	7.7	1.0
Servia	8,045	678	9.2	.
Spain	54,027	4,806	9.8	..
Sweden	245,757	23,108	10.4	0.9
Switzerland	210,032	9,192	4.5	0.8
Total	8,761,965	719,999	8.9	32.5
South America	136,676	.	..	0.5
All other countries	720,168	..	.	2.7
Total World	26,962,107	2,384,653	9.7	[illegible]

COMPARISON OF DEVELOPMENT OF
AMERICAN AND EUROPEAN CITIES
BY FIVE YEAR PERIODS



The table on the opposite page shows the estimated total length of telephone and telegraph wires January 1, 1911, including railroad telephone and telegraph wire.

The statistics place the total length of telephone and telegraph wires in the world January 1, 1911, at 34,500,000 miles. Of this total, telephone wire took 78%, telegraph wire (including cables) 17%, and railroad telegraph wire 5%. Again, the United States took 62% of the total telephone wire, and 34% of the total telegraph wire (excluding cables and railroad telegraph wire).

Length of World's Telephone and Telegraph Wire.

(Partly Estimated)

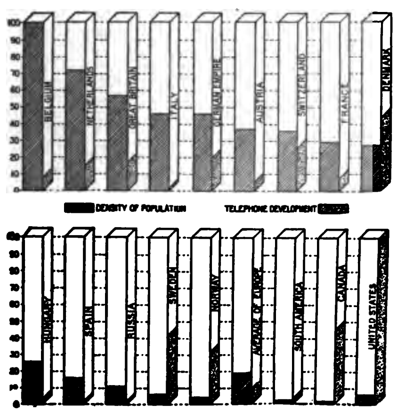
JANUARY 1, 1911.

TELEPHONE WIRE:	Miles	
United States	16,634,000	
Canada	709,000	
Europe	8,762,000	
All other Countries	857,000	
	26,962,000	
U. S. RAILROAD TELEPHONE WIRE	120,000	
Total Telephone Wire		27,082,000
TELEGRAPH WIRE:		
United States	1,849,000	
Canada	153,000	
Europe	2,352,000	
All other Countries	1,090,000	
	5,444,000	
SUBMARINE TELEGRAPH WIRE (in cables)	314,000	
RAILROAD TELEGRAPH WIRE	1,726,000	
Total Telegraph Wire		7,484,000
Grand Total		34,566,000

A more comprehensive view of the relation between telephone development and population is gained from the following chart. This chart compares European countries, the United States and Canada, representing in each case both population per square mile and telephones per 100 population. The greatest population per square mile is found in Belgium, which has 663 inhabitants to the square mile, and the largest number of telephones per 100 population is found in the United States, which January 1, 1911, had 8.1 telephones per 100 population.

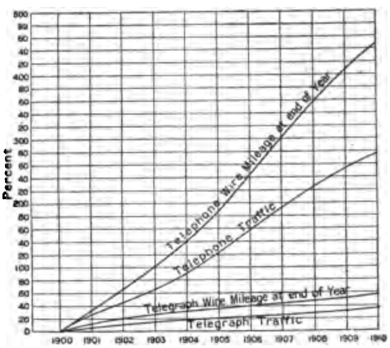
COMPARISON OF
DENSITY OF POPULATION
AND
TELEPHONE DEVELOPMENT
JAN 1, 1911

Note: Density of population in Belgium and telephone development (telephones per 100 population) in the United States taken as 100%.

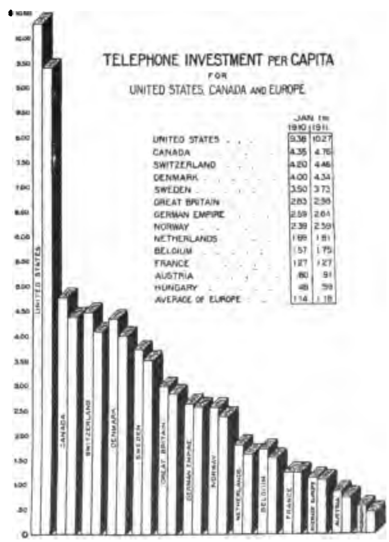


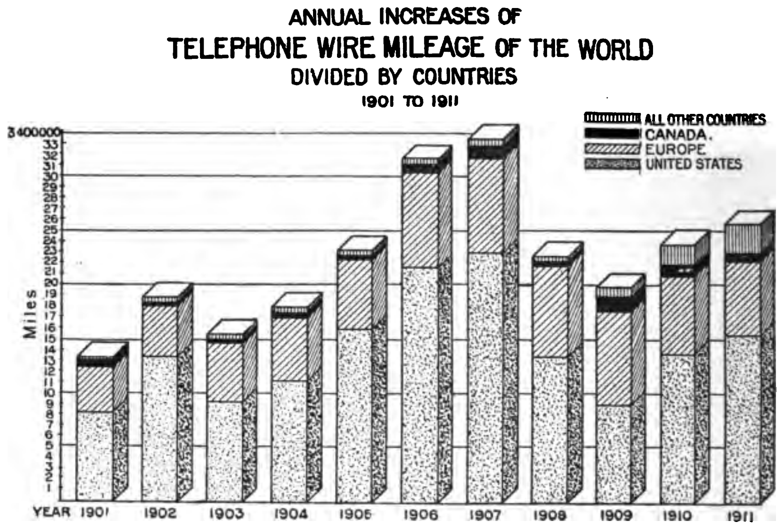
It is evident from the chart that Canada has by far the lowest density of population; next comes South America and then Norway, while Sweden is about equal to the United States, and Italy to Germany. In telephone development Canada ranks next to the United States. Denmark and Sweden, which have about the same development, are still considerably below one-half the telephone development of the United States.

THE GROWTH OF
TELEPHONE AND TELEGRAPH TRAFFIC
AND WIRE MILEAGE COMPARED
THE WORLD



Note: Growth expressed as a percentage increase over the 1900 figures.





Telephone Investment.

The statistics referring to investment do not always represent the actual replacement values of the various telephone plants, as such information is not recorded by the majority of foreign telephone administrations. The only data available in many cases are the aggregate amounts that have been put into the business since its inception. The world's telephone investment January 1, 1911, is estimated at $1,561,800,000, equivalent to $139 per telephone. This total investment is thus approximately equal to the value of the corn crop of the United States in 1911.

Of this total investment of $1,561,800,000, the United States invested $956,700,000, or 61.2 per cent. of the total; Canada $36,700,000, or 2.4 per cent. of the total; Europe $518,400,000, or 33.2 per cent. of the total; and all other countries $50,000,000, or 3.2 per cent. of the total.

Figured on the respective number of telephones on Jan. 1, 1911, the investment per telephone is:

United States	$126
Canada	129
Europe	175
All other countries	118
Total world	139

The investment representing "all other countries" includes $16,456,000 for the Commonwealth of Australia and New Zealand, $4,795,000 for the Union of South Africa, $15,223,000 for Japan, and about $6,668,000 for Brazil and Chili together.

During the year 1910, $145,500,000 was added to the telephone investment of the world, so that the above total of $1,560,800,000 represents an increase of 10% over the corresponding investment Jan. 1, 1911. In the United States alone, the estimated increase in investment during 1910 amounted to $97,600,000, or, excluding Europe, considerably more than the total cost of all telephone plants in service in the entire world.

In regard to the more detailed investment statistics given on the following page, perhaps the most striking feature of the table is the high figure for investment per telephone in many of the important European States. For instance, Austria, Belgium, France, Great Britain, Hungary, Spain, and Switzerland all show an investment per telephone of over $200.

The German Empire, Great Britain, and France combined have slightly more than two-thirds the entire telephone investment of Europe.

Excepting the German Empire and Great Britain, none of the European States exceeds $100,000,000, and the majority have invested less than $20,000,000 apiece. Of the Scandinavian kingdoms, Sweden has approximately twice the investment of Denmark, which in turn has about twice that of Norway.

Viewing telephone investment from a per capita basis, a very different situation is revealed. A glance at the chart on page 315 shows that of the European countries Switzerland leads, and Denmark has advanced to second position; on the other hand, though the German Empire occupied first rank in point of total investment, it takes fifth place in point of investment per capita. The per capita investment of the United States ($10.27) is about nine times that of Europe ($1.18). Of the European countries shown on the chart, Hungary has the lowest per capita investment ($0.59), and Austria has not yet reached an investment of $1.00 per capita.

INVESTMENT—TELEPHONE AND TELEGRAPH.

It is interesting to compare the telephone investment of the world with that of the telegraph (including submarine cables). In the absence of any definite information covering the entire world on that subject, only an estimate can be made. Using the total telegraph wire mileage, January 1, 1911, as a basis, the telegraph investment may be estimated at about $700,000,000. There are also 314,000 miles of submarine cables representing an estimated investment of $350,000,000, so that the total telegraph investment of the world January 1, 1911, may be placed at $1,050,000,000, as compared with a telephone investment of $1,561,777,000 at the same date.

This makes a total investment of $2,619,497,000 for telephone and telegraph (including submarine cables) for the world, January 1, 1911. Of this total 60 per cent. is invested in telephones, 27 per cent. in telegraphs and 13 per cent. in cables.

TELEPHONE GROSS EARNINGS OF THE UNITED STATES, CANADA, EUROPE AND ALL OTHER COUNTRIES
(Partly Estimated)
YEAR 1909

Division	Gross Earnings	% to Total Earnings	Increase During 1909	Avg. Earnings per Telephone
United States	$221,471,000	67.4%	$20,881,000	$32.87
Canada	6,752,032	2.0	1,161,000	31.87
Europe—				
Austria	3,704,990	1.1	584,000	41.45
Belgium	2,066,740	0.6	152,000	50.75
Bosnia	11,555	..	1,900	21.90
Bulgaria	65,135	..	7,000	31.65
Denmark	2,040,158	0.6	233,000	24.48
Finland	448,518	..	..	15.95
France	8,161,600	2.4	1,098,000	40.20
German Empire	32,330,909	9.8	3,407,000	35.00
Great Britain	23,113,326	7.0	1,858,000	39.40
Greece	37,048	..	4,000	26.40
Hungary	1,859,205	0.6	155,000	38.85
Italy	2,416,902	0.8	348,000	42.70
Luxembourg	62,697	..	6,000	20.80
Netherlands	1,731,700	0.5	244,000	32.45
Norway	1,159,864	0.3	40,000	21.35
Portugal	240,516	..	10,000	40.90
Roumania	277,947	..	35,000	22.50
Russia	4,756,475	1.4	489,700	39.00
Servia	58,575	..	4,000	37.65
Spain	831,125	..	38,000	35.20
Sweden	3,959,765	1.2	309,000	23.60
Switzerland	1,996,439	0.6	169,000	27.95
Total	91,331,189	27.8	9,172,600	35.40
All other countries	9,163,500	2.8		30.00
Total world	$328,717,721	100.0%		

COMPARISON OF THE GROSS TELEPHONE AND TELEGRAPH EARNINGS OF EUROPEAN COUNTRIES FOR 1909.

Country	Gross Telephone Earnings	Gross Telegraph Earnings	Total Earnings	Per cent of Total Gross Earnings	
				Telephone	Telegraph
Austria	$3,704,990	$3,162,571	$6,867,561	54%	46%
Belgium	2,066,740	1,191,450	3,258,190	63%	37%
Bosnia	11,555	281,324	292,879	4%	96%
Bulgaria	65,135	294,610	359,745	18%	82%
Denmark	2,040,158	488,697	2,528,855	81%	19%
France	8,161,600	8,101,828	16,263,428	50%	50%
German Empire	32,330,909	8,771,920	41,102,829	79%	21%
Great Britain	23,113,326	15,960,869	39,074,195	59%	41%
Greece	37,048	346,794	383,842	10%	90%
Hungary	1,859,205	1,491,079	3,350,284	55%	45%
Italy	2,416,902	3,820,513	6,237,415	39%	61%
Luxembourg	62,697	16,338	79,035	79%	21%
Netherlands	1,731,700	1,011,475	2,743,175	63%	37%
Norway	1,159,864	642,875	1,802,739	64%	36%
Portugal	240,516	849,862	1,090,378	22%	78%
Roumania	277,947	595,106	873,053	32%	68%
Russia and Finland	5,204,993	12,408,158	17,613,151	30%	70%
Servia	58,575	120,823	179,398	33%	67%
Spain	831,125	2,032,422	2,863,547	29%	71%
Sweden	3,959,765	615,049	4,574,814	86%	14%
Switzerland	1,996,439	812,661	2,809,100	71%	29%
Total Europe	$91,331,189	$63,016,424	$154,347,613	59%	41%

EARNINGS FOR 1909—TELEPHONE AND TELEGRAPH.

The figures for gross telephone earnings in European countries are official, but those quoted for "all other countries" are mostly estimated. The total gross telephone earnings of the world for the year 1909 may be placed at $329,000,000, of which the United States earned $221,471,000 (67.4%), Canada $6,752,000 (2%), Europe $91,331,000 (27.8%), and all other countries $9,163,500 (2.8%).

The adjoined table shows the gross telephone earnings of the various European countries, ranging from $241,000 (Portugal) to $32,331,000 (German Empire). The average earnings per telephone for total Europe was $35.40.

On account of the almost universal custom af European governments of conducting the telephone as a branch of the postal and telegraph services, practically no European government keeps its accounts in such a manner as to reveal the true net financial result of its telephone service.

TRAFFIC—MAIL, TELEGRAPH AND TELEPHONE.

Instructive as it would be to compare the traffic of the other two branches of transmission of intelligence—the mail and the telegraph—with the telephone traffic of the world, such a comparison would only be speculative on account of the lack of statistical material. There is, however, sufficient statistical information to permit a comparison of the traffic of these three services, both in the United States and in Europe, during the year 1909. The result is as follows:

Out of a total of 20,669,000,000 messages transmitted by the three services in Europe, 15,387,000,000 (74.4 per cent.) were by first class mail matter, 345,000,000 (1.7 per cent.) by telegrams and 4,937,000,000 (23.9 per cent.) by telephone. In the United States, out of a total of 21,508,000,000 messages, 8,793,000,000 (40.9 per cent.) were by first class mail matter, 98,000,000 (0.4 per cent.) by telegrams and 12,617,000,000 (58.7 per cent.) by telephone.

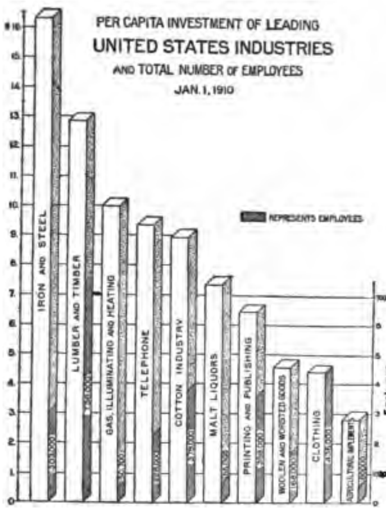
The figures show that although Europe has about three and a half times the telegraph traffic and nearly twice the first-class mail traffic, it has only one-third the telephone traffic of the United States.

The first class mail, telegraph and telephone traffic per 1,000 population for Europe and the United States during 1908 and 1909 was as follows:

For Europe; 35,533 pieces of first class mail matter in 1909, as against 34,766 in 1908, an increase of 2.2 per cent.; 798 telegrams in 1909, as against 769 in 1908, an increase of 3.7 per cent.; 11,400 telephone conversations in 1909, as against 10,585 in 1908, an increase of 7.7 per cent. For the United States: 96,090 pieces of first class mail matter in 1909, as against 90,062 in 1908, an increase of 6.7 per cent.; 1,076 telegrams in 1909, as against 1,039 in 1908, an increase of 3.5 per cent; 137,882 telephone conversations in 1909, as against 134,335 in 1908, an increase of 2.6 per cent.

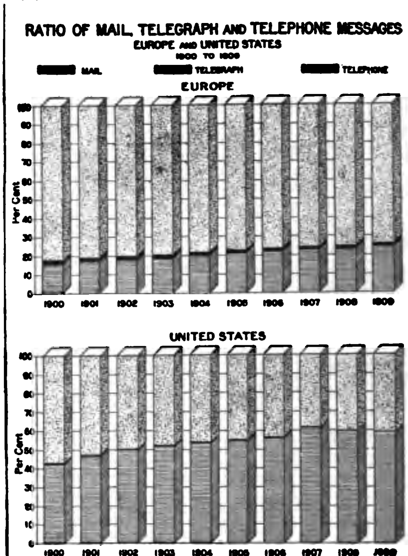
A Comparison With Other Industries.

The magnitude of the United States telephone investment per capita may be emphasized by comparing the telephone with some of the other leading United States industries. Such a comparison is based on recent special reports by the United States Census Office, publishing the requisite data as of January 1, 1910. The chart shown below gives the result of a comparison of the telephone business with ten large United States industries. Despite the fact that the telephone has been in use but thirty-five years, the telephone investment per capita January 1, 1910 is the fourth largest, yielding only to the Iron and Steel, Lumber, and Gas and Heating industries.

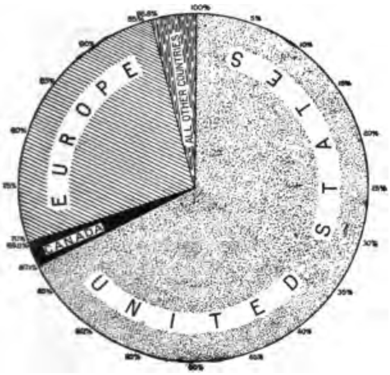


The New York Telephone Company distributed 1,500,000 new telephone directories of the issue dated May 8, 1913. It required the service of 600 men working fifteen days to make the deliveries of this book, which comprises 864 pages. The number of subscribers listed is 296,000, not including the many thousands of branches in apartment houses, hotels and pay stations. The approximate cost of the telephone directory is $1,200 a day, or $438,000 annually. The first telephone directory was issued in 1878; at that time the total number of subscribers was 252.

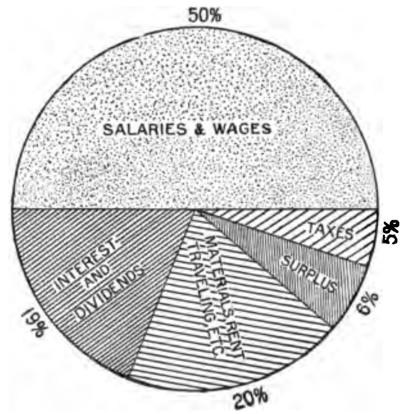
One of the earliest experiments for reproducing sounds by means of sound boards connected by a rod was Wheatstone's "Magic Lyre," 1831. In 1861 Philip Reis conducted experiments to reproduce human speech by means of electric pulsation. In 1875 Prof. Bell invented the electric telephone, which he patented in 1876. Edison patented an invention of his July; 1877.



DISTRIBUTION OF THE WORLD'S TELEPHONES
JANUARY 1, 1912.
12,453,000
(Partly Estimated)



DISPOSITION OF THE GROSS REVENUE OF THE BELL SYSTEM, YEAR 1911.



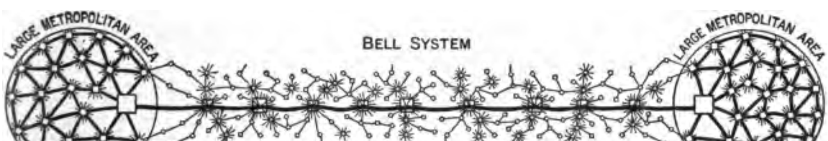


Diagram illustrating a telephone trunk line of 40 wires, being one of a number of such trunk lines joining two large metropolitan areas 250 miles apart and serving intermediate cities, towns and rural districts in a narrow strip of territory on each side. When used for the telephone exclusively this trunk line furnishes 30 telephone circuits, including both phantom and physical, reaching 700,000 telephone stations.

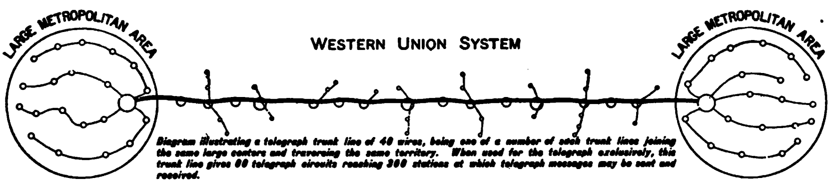


Diagram illustrating a telegraph trunk line of 40 wires, being one of a number of such trunk lines joining the same large centers and traversing the same territory. When used for the telegraph exclusively, this trunk line gives 80 telegraph circuits reaching 300 stations at which telegraph messages may be sent and received.

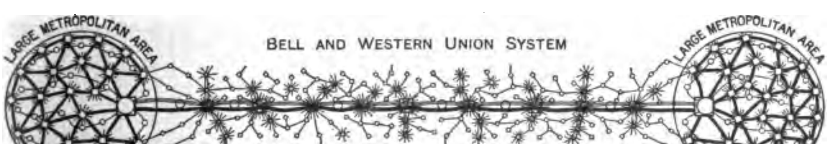


Diagram illustrating these same two trunk lines worked in co-operation so as to provide both telephone and telegraph service upon each simultaneously. When thus operated there are obtained a total of 160 through telegraph circuits, a gain of 80, and a total of 60 through telephone circuits, a gain of 30, over the combined facilities of the two lines when one is used only for the telephone and the other only for the telegraph. The number of stations where telegrams may be received and sent is increased from 300 to 700,000.

Telephone Central Office — Telephone Toll Station — Telegraph Office

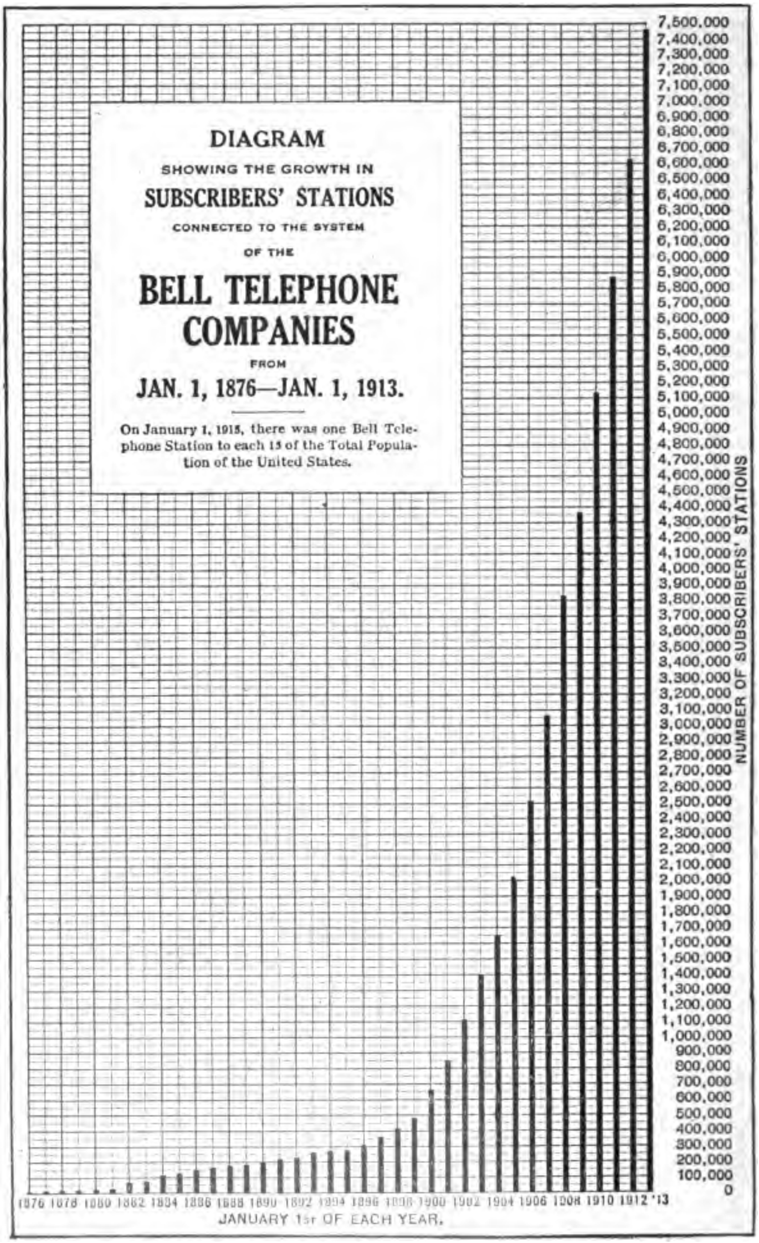


DIAGRAM
SHOWING THE GROWTH IN
SUBSCRIBERS' STATIONS
CONNECTED TO THE SYSTEM
OF THE
BELL TELEPHONE COMPANIES
FROM
JAN. 1, 1876—JAN. 1, 1913.
On January 1, 1913, there was one Bell Telephone Station to each 15 of the Total Population of the United States.
NUMBER OF SUBSCRIBERS' STATIONS
7,500,000
7,400,000
7,300,000
7,200,000
7,100,000
7,000,000
6,900,000
6,800,000
6,700,000
6,600,000
6,500,000
6,400,000
6,300,000
6,200,000
6,100,000
6,000,000
5,900,000
5,800,000
5,700,000
5,600,000
5,500,000
5,400,000
5,300,000
5,200,000
5,100,000
5,000,000
4,900,000
4,800,000
4,700,000
4,600,000
4,500,000
4,400,000
4,300,000
4,200,000
4,100,000
4,000,000
3,900,000
3,800,000
3,700,000
3,600,000
3,500,000
3,400,000
3,300,000
3,200,000
3,100,000
3,000,000
2,900,000
2,800,000
2,700,000
2,600,000
2,500,000
2,400,000
2,300,000
2,200,000
2,100,000
2,000,000
1,900,000
1,800,000
1,700,000
1,600,000
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1876 1878 1880 1882 1884 1886 1888 1890 1892 1894 1896 1898 1900 1902 1904 1906 1908 1910 1912 '13
JANUARY 1st OF EACH YEAR.

The growth of the Bell System, its broader usefulness and resulting prosperity, are shown in the annual report of the American Telephone and Telegraph Company for 1912 by the financial statement and other comparative statistics.

At the end of the year 1912 there was a total of 7,456,074 subscriber stations, of which 2,502,627 were operated by connecting companies.

The Bell toll lines now reach 70,000 places, which is 5,000 more than the number of post offices and 10,000 more than the number of railroad stations in the United States. The total wire mileage has been increased to nearly 14,610,813 miles, of which over half is underground, and the new 450-mile subway between Boston and Washington has been completed.

The traffic over the Bell lines shows a daily average of 25,572,345 or at the rate of 8,950,000,000 connections a year.

There was spent in plant additions $76,626,900 in the year. There was applied to maintenance and reconstruction during the year $66,705,000, making a total provision for the last ten years of $409,000,000.

BELL TELEPHONE SYSTEM IN THE UNITED STATES.

CONDENSED STATISTICS.

	Dec. 31, 1895.	Dec. 31, 1900.	Dec. 31, 1905.	Dec. 31, 1910.	Dec. 31, 1911.	Dec. 31, 1912.	Increase, 1912.
Miles of Exchange Pole Lines	25,330	30,451	67,698	120,175	131,379	143,842	12,463
Miles of Toll Pole Lines	52,873	101,087	145,535	162,702	163,351	171,161	7,810
Total Miles of Pole Lines	78,203	131,538	213,233	282,877	294,730	315,003	20,273
Miles of Underground Wire	184,515	705,269	2,345,742	5,992,303	6,831,667	7,804,528	972,861
Miles of Submarine Wire	2,028	4,203	9,373	24,636	26,936	30,301	3,365
Miles of Aerial Wire	488,872	1,252,329	3,424,803	5,625,273	6,074,012	6,775,984	701,972
Total Miles of Wire	675,415	1,961,801	5,779,918	11,642,212	12,932,615	14,610,813	1,678,198
Comprising Toll Wire	215,687	607,599	1,265,236	1,963,994	2,060,514	2,189,163	128,649
Comprising Exchange Wire	459,728	1,354,202	4,514,682	9,678,218	10,872,101	12,421,650	1,549,549
Total	675,415	1,961,801	5,779,918	11,642,212	12,932,615	14,610,813	1,678,198
Total Exchange Circuits	237,837	508,262	1,135,449	2,082,960	2,306,360	2,576,789	270,429
Number of Central Offices	1,613	2,775	4,532	4,933	5,014	5,182	168
Number of Bell Stations	281,695	800,880	2,241,367	4,030,668	4,474,171	4,953,447	479,276
Number of Bell Connected Stations*	27,807	55,031	287,348	1,852,051	2,158,454	2,502,627	344,173
Total Stations	309,502	855,911	2,528,715	5,882,719	6,632,625	7,456,074	823,449
Number of Employees	14,517	37,067	89,661	120,311	128,439	140,789	12,350
Number of Connecting Companies, Lines and Systems				17,845	21,454	24,013	2,559
Exchange Connections Daily	2,351,420	5,668,986	13,543,468	21,681,471	23,483,770	25,572,345	2,088,575
Toll Connections Daily	51,123	148,528	368,083	602,539	644,918	737,823	92,905

*Includes Private Line Stations.

BELL TELEPHONE SYSTEM IN THE UNITED STATES.

ALL DUPLICATIONS BETWEEN COMPANIES EXCLUDED.

COMPARATIVE EARNINGS AT FIVE YEAR INTERVALS, 1885-1912.

	Year 1885.	Year 1890.	Year 1895.	Year 1900.	Year 1905.	Year 1910.	Year 1912.
Gross Earnings	$10,033,600	$16,212,100	$24,197,200	$46,385,600	$97,500,100	$165,612,881	$199,172,154
Expenses	5,124,300	9,067,600	15,488,400	30,632,400	66,189,400	114,618,473	142,285,464
Net Earnings	$4,909,300	$7,144,500	$8,708,800	$15,753,200	$31,310,700	$50,994,408	$56,886,690
Interest	27,700	278,700	655,500	2,389,600	5,836,300	11,556,864	14,205,365
Balance	$4,881,600	$6,865,800	$8,053,300	$13,363,600	$25,474,400	$39,437,544	$42,681,325
Dividends	3,107,200	4,101,300	5,066,900	7,893,500	15,817,500	25,160,786	29,460,215
Surplus Earnings	$1,774,400	$2,764,500	$2,986,400	$5,470,100	$9,656,900	$14,276,758	$13,221,110

PRINTERS' MARKS.

- ⊙ Period.
- , Comma.
- - Hyphen.
- : Colon.
- ; Semicolon.
- ' Apostrophe.
- "/" Quotations.
- □ Em quadrat.
- 1/m One-em dash.
- 2/m Two-em parallel dash.
- Push down space.
- Close up.
- ✓ Less space.
- ∧ Caret—left out, insert.
- 9 Turn to proper position.
- # Insert space.
- [or] Move to left or to right.
- ⌐ or ⌙ Move up or move down.
- *tr.* Transpose.
- ..... or *stet.* Let it stand.
- Dele—take out.
- ⊗ Broken letter.
- ¶ Paragraph.
- No ¶ No paragraph.
- *w. f.* Wrong font.
- or *eq. #* Equalize spacing.
- ≡ or *caps.* Capitals.
- = or *s. c.* Small capitals.
- *l. c.* Lower-case.
- or Superior or inferior.
- —— or *ital.* Italic.
- *rom.* Roman.
- [/] Brackets.
- (/) Parentheses.

TYPOGRAPHICAL ERRORS. *6-pt. ital. caps.*

It does not appear that the earliest printers had any method of correcting errors before the form was on the press/ The learned ~~The learned~~ correctors of the first two centuries of printing were not proofreaders in our sense/ they were rather what we should term office editors. Their labors were chiefly to see that the proof corresponded to the copy, but that the printed page was correct in its latinity/ ~~that the words were there,~~ and that the sense was right. They cared ~~but~~ little about orthography, bad letters or purely printers errors, and when the text seemed to them wrong they consulted fresh authorities or altered it on their own responsibility. Good proofs in the modern sense, were impossible until professional readers were employed/ men who had first a printer's education, and then spent many years in the correction of proof. The orthography of English, which for the past century has undergone little change, was very fluctuating until after the publication of Johnson's Dictionary, and capitals, which have been used with considerable regularity for the past 80 years, were previously used on the miss or hit plan. The approach to regularity, so far as we have may be attributed to the growth of a class of professional proof readers, and it is to them that we owe the correctness of modern printing. More er/ors have been found in the Bible than in any other one work. For many generations it was frequently the case that Bibles were brought out stealthily, from fear of governmental interference. They were frequently printed from imperfect texts, and were often modified to meet the views of those who published them. The story is related that a certain woman in Germany, ~~who was~~ the wife of a printer, ~~and~~ had become disgusted with the continual assertions of the *superiority* of man over woman which she had heard, hurried into the composing room while her husband was at supper and altered a sentence in the Bible, which he was printing, so that it read Narr instead of Herr, thus making the verse read "And he shall be thy fool" instead of "and he shall be thy lord." The word not was omitted by Barker, the king's printer in England in 1632, in printing the seventh commandment He was fined £3000 on this account.

4/2

NUMBER OF WORDS AND EMS TO THE SQUARE INCH.

Sizes of type.	Number of words. Solid.	Number of words. Leaded.	Number of ems.
14-point	11	8	26¼
12-point	14	11	36
11-point	17	14	43
10-point	21	16	52
8-point	32	23	81
6-point	47	34	144
5-point	69	50	207

CHAPTER XII.

POST OFFICE AFFAIRS.*

PART I.

STATISTICAL INFORMATION.

UNITED STATES POST OFFICE.

SUMMARY OF ALL CLASSES DOMESTIC MAIL SERVICE IN OPERATION JUNE 30, 1912.

Number of routes	12,208
Length of routes, miles	2,761,466.751
Number of miles traveled per annum	493,384,878.76
Annual rate of expenditure	79,150,763.65
Average rate of cost per mile of length	286.62
Average rate of cost per mile traveled, cents	16.04
Average number of trips per week	17.17

SOURCE OF REVENUE.

	Total for fiscal year.
Sale of postage stamps, stamped envelopes, postal cards, etc.	$221,563,619.00
Second-class postage, paid in money	9,399,140.61
Third and fourth class postage, paid in money	5,444,615.19
Box rents	4,645,664.04
Miscellaneous receipts	209,263.76
Letter postage, paid in money	71,700.92
Fines and penalties	55,201.95
Dead letters	33,122.39
Revenue from money-order business	4,843,364.74
Unpaid money orders more than 1 year old	478,314.28
Total	$246,744,015.88

EXPENDITURE BY ITEMS FOR YEAR 1912.

Service in post offices:	
Salaries of postmasters	$28,648,426.33
Salaries of clerks, etc.	42,479,908.91
City Delivery Service	34,252,952.62
All other expenditures	11,216,932.31
Total	$116,598,220.17
Railway Mail Service	$20,876,963.37
Rural Delivery Service	41,900,514.79
Transportation of domestic mail:	
By railroads	$51,819,411.82
By other means of transportation	13,204,261.75
Total	$65,023,673.57
Transportation of foreign mail	$3,716,181.11
Payments on account of invalid money orders	509,387.28

RAILROAD TRANSPORTATION.

SERVICE AND EXPENDITURE.

Number of routes	3,409
Length of routes, miles	226,071.02
Annual travel, miles	458,648,623.77
Annual rate of expenditure	$46,336,293.86
Average rate of cost per mile of length	204.96
Average rate of cost per mile traveled, cents	10.10
Average number of trips per week	19.51

On June 30, 1912, there were in operation 159 full railway post-office lines, manned by 1,607 crews of 8,066 clerks (including 161 acting clerks). Of these 159 full lines, 141 had apartment-car service, manned by 1,040 crews, of 1,598 clerks. There were also 1,377 apartment railway post-office lines, manned by 4,287 crews, of 5,554 clerks; 17 electric car lines, with 18 crews, of 19 clerks; 53 steamboat lines, with 86 crews, of 86 clerks; a total of 1,606 lines of all kinds, manned by 15,323 clerks, representing the working force of the lines. In addition there were 32 officials, 129 chief clerks, 622 transfer clerks employed in handling the mails at important junction points, 521 clerks detailed to clerical duty in the various offices of the service, and 448 clerks employed in terminal railway post offices—an aggregate of 17,075 employees in the service.

(Continued on page 324.)

*This chapter is divided into two parts: the first gives statistics relative to the Post Office Affairs of the United States and the World, the second deals with information relative to rates, etc., domestic and foreign and the "Parcel Post." Revised through the courtesy of Postmaster-General Burleson.

(Continued from page 323.)

Of the 1,388 full railway post-office cars in use and in reserve, 545 are all-steel cars, 182 steel-underframe cars, and 661 wooden cars, and of the 4,029 apartment cars in use and in reserve, 181 are all-steel cars, 221 steel-underframe cars, and 3,627 wooden cars.

During the fiscal year the department has permitted further experimental aeroplane mail service. There have been 31 orders issued permitting the mail to be carried between certain points by aeroplanes. Such service was merely temporary and was not intended to be permanent. In each instance where the mail has been carried the service has been performed by a sworn carrier and without cost to the department. Such service was authorized in 16 different States.

Reports received of the performance of the service by aeroplanes under the various orders issued permitting such service indicate that in many instances service was performed in a reasonable satisfactory manner.

MAIL SERVICE IN OPERATION YEAR ENDING JUNE 30, 1912.

Service.	Number.	Aggregate length.	Annual rate of expenditure.
		Miles.	
Star routes in Alaska	22	4,248.00	$196,896.93
Steamboat routes	237	31,875.57	752,610.06
Mail-messenger routes	7,694	5,183.17	1,620,151.35
Pneumatic-tube routes	6	54.8451	932,366.70
Wagon routes (in cities)	283	1,241.17	1,698,236.46
Railroad routes	3,409	226,071.02	46,336,293.86
Railway post-office cars			4,367,029.16
Electric and cable car routes	557	7,472.90	686,555.77
Total	12,208	276.146.6751	56,590,140.29
Star routes in Alaska (emergency)			[1] 38,092.00
Steamboat routes (pound rate)			[2] 86,671.63
Railroad transportation, miscellaneous:			
Periodical mails			[3] 469,612.76
Mail weighings, etc			[3] 244,876.25
Freight on mail bags, postal cards, etc			[3] 407,511.52
Railway Mail Service (officers and clerks, including acting clerks)	17,075		[3] 20,876,963.37
Mail equipment			[3] 436,309.15
Miscellaneous expenses			[3] 596.68
Total inland service			79,150,763.65
Foreign mails:			
Aggregate cost		$3,704,532.92	
Less intermediary service to foreign countries		$508,649.65	
			3,195,883.27
Total			82,346,646.92

[1] Authorization. [2] Actual expenditures. [3] Estimated actual expenditures.

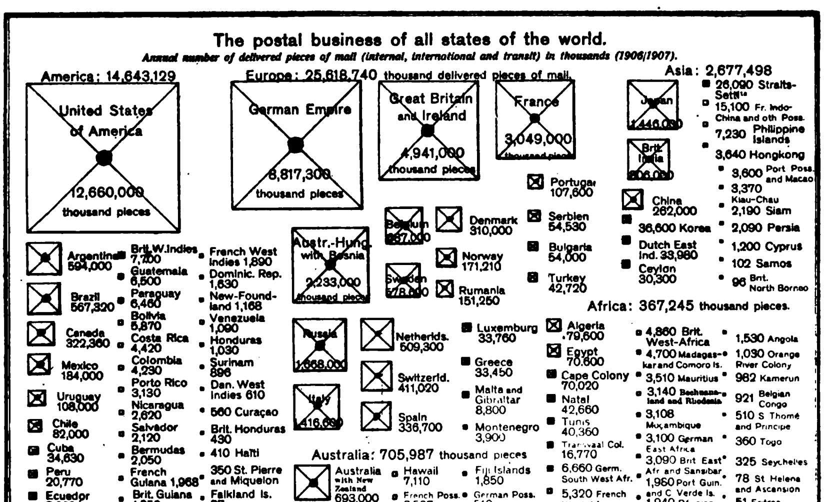
COMPARISON OF REVENUES AND EXPENDITURES FOR THE FISCAL YEAR ENDED JUNE 30, 1912, WITH THOSE OF THE PRECEDING YEAR.

Items.	Fiscal year. 1911	Fiscal year. 1912
REVENUES.		
Ordinary postal revenues	$23[illegible]07,557.29	$241,422,336.86
Revenues from money-order business	[illegible]72,266.31	5,321,679.02
Total revenues from all sources	$237,[illegible]79,823.60	$246,744,015.88
EXPENDITURES.		
Expenditures on account of the fiscal year	$238,623,350.37	$248,624,940.29
Total revenues during the year	237,879,823.60	246,744,015.88
Excess of expenditures over revenues	$743,526.77	$1,880,924.41
Amount of losses by fire, burglary, bad debts, etc	11,778.80	4,088.90
Deficit in the postal revenues	755,305.57	1,885,013.31

EXPENDITURES, APPROPRIATIONS AND ESTIMATES FOR ALL TRANSPORTATION SERVICES EXCEPT RURAL DELIVERY AND STAR ROUTE SERVICE.

Service, etc.	Expenditures for fiscal year ended June 30, 1912.	Appropriation for fiscal year ending June 30, 1913.	Estimate for fiscal year ending June 30, 1914.
Star service in Alaska	[1]$232,826.58	$250,000.00	$508,300.00
Steamboat service	820,470.18	853,700.00	909,900.00
Mail-messenger service	1,605,514.60	1,681,900.00	2,167,300.00
Pneumatic-tube service	932,566.36	987,400.00	962,200.00
Wagon service (in cities)	1,690,682.04	1,732,000.00	2,160,600.00
Mail bags, etc.	284,505.39	282,000.00	355,500.00
Labor in mail-bag repair shop	99,003.59	102,000.00	108,300.00
Subworkshop, Chicago, Ill.	2,461.97	2,400.00	2,400.00
Mail locks and keys	11,302.90	12,000.00	15,000.00
Labor in mail-lock repair shop	33,991.91	36,500.00	38,000.00
Railroad transportation	47,298,087.47	47,646,000.00	49,661,000.00
Tabulating information relative to railroad companies	5,431.99	....	....
Freight on mail bags, postal cards, etc.	424,774.18	[2]648,200.00	500,000.00
Railway post-office cars	4,521,324.35	4,707,000.00	5,393,000.00
Railway mail service	20,876,963.37	25,209,224.00	26,673,488.00
Electric and cable car service	682,544.65	728,000.00	847,400.00
Total inland service	79,522,451.53	84,878,324.00	90,302,388.00
Foreign mail service:			
Transportation	3,241,564.72	3,748,400.00	3,981,900.00
Assistant superintendent, New York, N.Y.	2,500.00	2,500.00	2,500.00
Balance due foreign countries	472,116.39	486,400.00	475,000.00
Delegates to International Postal Union at Madrid	....	5,000.00	....
Miscellaneous expenses	....	1,000.00	1,000.00
Aggregate	83,238,632.64	89,121,624.00	94,762,788.00

[1] Star service, except in Alaska, transferred to office of Fourth Assistant Postmaster General.
[2] Includes $123,200 made immediately available for deficiency for fiscal year 1912.



POSTAL SERVICE OF

Name of Countries.	No. of Post Offices. 1	No. of Letter Boxes. 2	No. of Employees. 3	Number of Letters. Postage Prepaid. 4	Number of Letters. Not Prepaid. 5	Number of Post Cards. Single 6	Number of Post Cards. With reply paid. 7
Germany	50,777	155,766	233,270*	2,476,780,330	43,392,540	1,617,230,530	Inc. Col. 6
Austria	10,312	44,467	71,262†	603,418,660	10,401,620	447,389,720	4,069,250
Belgium	1,658	11,143	10,874	139,531,772	605,228	96,005,799	335,036
Denmark	1,629	11,981	8,455	97,485,230	389,916	31,837,730	89,650
France	14,379	79,274	15,773	1,219,760,025	3,852,599	527,516,500	75,430
Great Britain	24,387	71,986	110,462*	3,044,549,000	Inc. Col. 4	881,971,000	Inc. Col. 6
Italy	11,089	39,767	233,811	261,727,940	4,794,832	138,955,214	10,373,550
Japan	7,790	67,694	50,320	347,068,083	Inc. Col. 4	966,142,328	Inc. Col. 6
Mexico	2,911	2,285	72,008	58,100,443	33,801	6,468,698	27,819
Norway	3,496	5,271	9,322	49,316,000	163,000	13,321,000	246,200
Netherlands	1,511	6,210	6,174	111,718,854	844,350	89,919,830	620,802
Portugal	4,081	6,135	10,623	28,661,037	91,005	16,736,613	18,640
Russia	16,452	31,714	8,492	724,871,540	21,329,899	304,953,527	14,392,093
Spain	5,573	9,005	95,187	114,217,174‡	....	9,304,872	83,352
Sweden	4,121	7,940	11,397	118,524,171	296,602	33,943,727	363,218
Switzerland	9,968	13,472	17,462	149,083,319	258,720	87,797,757	490,699

* Includes employees in postal, telegraph and telephone services.
† Includes employees in postal and telegraph services.

FOREIGN MAIL SERVICES.

The cost of the Foreign Mail Service during the fiscal year ended June 30, 1912, was distributed as follows:

Trans-Atlantic service	$1,623,720.81
Trans-Pacific service	206,503.07
Miscellaneous service	754,795.30
Panama Railroad service for transit of mails of United States origin	67,937.48
Sea post service	73,296.13
Steamboat transfer service, New York, and other miscellaneous expenditures	929,280.13
Making the aggregate cost of the service	$3,704,532.92

The weights of the mails dispatched by sea to foreign countries was:

	Pounds.
Letters and post cards	2,978,533
Other articles	18,085,007
Total	21,063,540

In the Trans-Pacific service, steamers of United States register carried a total of 23,495,841 grams, equal to 51,698 pounds of letters, and 313,228,417 grams, equal to 690,668 pounds of prints; and the total compensation they received was $116,868.47.

PRINTING POSTAL CARDS.
This work is now done in the Government Printing Office at Washington.

COILING POSTAGE STAMPS

THE WORLD—Domestic..

Printed matter. 8	Commercial papers. 9	Samples of merchandise. 10	Total including free matter. 11	Money orders. Number 12	Money orders. Value in dollars. 13
1,533,666,130	19,990,630	67,372,810	5,951,037,230	174,933,220	$2,178,084,236.15
160,884,250	....	16,117,220	1,348,714,830	31,773,970	310,536,607.63
339,301,099	3,558,074	6,770,530	683,232,614	4,462,189	87,348,323.68
17,119,932	....	747,232	147,669,690	4,683,249	52,526,336.90
1,340,676,756	54,303,215	72,181,122	3,333,800,657	62,271,463	559,824,312.65
1,219,894,000	Inc. Col. 4	Inc. Col. 4	5,146,414,000	139,358,000	439,781,392.80
729,157,500	10,123,490	10,821,920	1,238,648,556	24,064,001	496,239,303.30
237,483,694	19,813,806	6,987,629	1,637,180,446	18,364,012	124,737,126.76
86,975,467	128,409	264,704	155,709,662	1,402,130	22,214,368.90
9,000,000	106,000	294,500	78,780,700	922,519	14,332,634.85
257,608,546	....	2,456,220	477,306,258	6,344,914	35,936,077.87
32,167,567	749,080	1,092,778	82,530,618	794,653§	11,767,636.92
146,789,940	12,592,170	10,794,581	1,457,547,584	41,930,398	1,074,242,550.17
139,615,236	....	1,429,626	281,373,898	292,348	1,781,509.66
45,357,535	598,647	1,053,161	205,363,522	8,204,379§	78,501,785.19
67,062,703	....	1,477,836	321,271,273	5,991,885	124,734,419.70

‡ Prepayment of ordinary letters is required in Spain.
§ Includes money orders by telegraph.

VALUE OF POSTAGE STAMPS ISSUED IN THE UNITED STATES, YEAR ENDING JUNE 30, 1912

Adhesive postage stamps.	Ordinary.	Postage-due.
1-cent	3,702,640,699	8,580,399
1-cent, in coils	58,533,500	....
1-cent, in stamp books	206,507,976	....
2-cent	5,056,061,799	26,163,699
2-cent, in coils	185,242,000	....
2-cent, in stamp books	291,153,156	....
3-cent	67,439,299	612,099
3-cent, in coils	1,005,500	....
4-cent	91,499,199	....
4-cent, in coils	454,000	....
5-cent	109,973,499	1,672,199
5-cent, in coils	39,000	....
6-cent	38,756,499	....
8-cent	27,282,499	....
10-cent	78,169,699	5,273,099
15-cent	13,573,119	....
30-cent	....	3,139
50-cent	696,123	3,729
1-dollar	143,336	....
2-dollar	1,238	....
5-dollar	1,608	....
10-cent special-delivery	15,196,378	....
10-cent registry	16,598,659	....
Total	9,960,968,785	42,308,363
Value	$181,121,762.59	$1,241,166.99

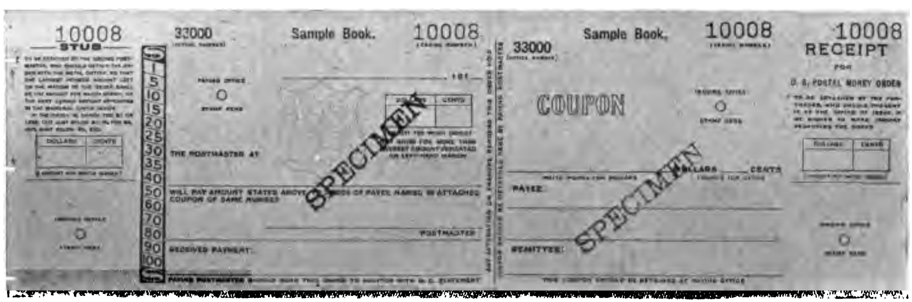
The total issue of postage stamps, stamp books, stamped envelopes, newspaper wrappers, postal cards and international reply coupons for the fiscal year ending June 30, 1912, was $227,593,-704.10. The international reply coupons was the smallest item, the amount being only $6,251.34.

POSTAL SERVICE OF THE WORLD—Continued.

Foreign postal matter received.	Number of Letters.		Number of post cards		Printed matter.	Commercial papers.	Samples of merchand'e	Total including free matter.	Money orders issued.	
	Postage prepaid. 1	Not prepaid. 2	Single. 3	With reply paid. 4	5	6	7	8	Number. 9	Value in dollars. 10
Germany	154,781,090	2,341,940	97,348,780	In. Col. (3)	61,397,760	2,826,780	11,301,230	333,940,290	6,549,020	$66,051,131.12
Austria	142,413,050	1,464,340	83,004,580	628,580	50,048,910	291,050	8,212,620	289,359,700	7,128,440	87,411,000.37
Belgium	32,233,084	655,980	12,364,508	29,328	23,535,668	446,056	2,067,988	71,493,032	747,078	10,317,258.54
Denmark	9,117,914	119,808	3,915,769	4,043	3,427,073	39,923	505,167	17,129,697	428,324	3,588,232.26
France	94,455,932	402,016	5,591,726	240,577	52,435,336	868,875	3,993,739	157,988,201	2,081,214	27,024,681.20
Great Britain	140,242,000	2,009,000*	23,529,000	Inc. Col. (3)	45,606,000	Inc. Col. (5)	Inc. Col. (5)	211,386,000	8,680,000	59,131,648.80
Italy	41,760,110	1,590,045	11,375,131	125,230	24,161,450	269,715	2,030,890	81,432,406	2,652,945	53,240,279.12
Japan	13,162,403	66,863	8,597,828	62,602	4,962,987	139,641	165,685	28,021,430	163,436	5,550,852.54
Mexico	10,459,005	186,549	939,098	3,954	7,684,983	19,154	121,286	19,625,107	173,127	3,807,800.34
Norway	8,339,300	106,800	2,482,000	5,200	3,798,000	23,000	331,400	15,100,200	220,882	4,402,067.13
Netherlands	25,690,468	317,633	8,206,788	51,741	13,282,055	194,727	1,310,071	49,114,774	671,752	7,003,912.73
Portugal	6,825,851	56,017	1,266,466	2,067	3,452,163	167,333	178,423	11,967,650	33,045†	584,656.83
Russia	72,535,639	1,061,469	28,247,788	1,524,150	36,774,443	1,709,817	3,436,409	145,289,715	1,132,757	20,014,226.61
Spain	19,471,242	282,378	2,917,158	31,440	30,988,902	248,640	1,316,196	55,338,834	....	....
Sweden	14,914,302	143,273	3,399,253	6,968	5,844,756	55,705	603,408	24,822,928	364,916†	6,256,909.85
Switzerland	35,847,863	990,768	17,971,835	46,589	20,681,009	232,153	2,141,612	78,061,474	1,127,117	13,424,895.10

* Includes free matter.

† Includes money by telegraph.



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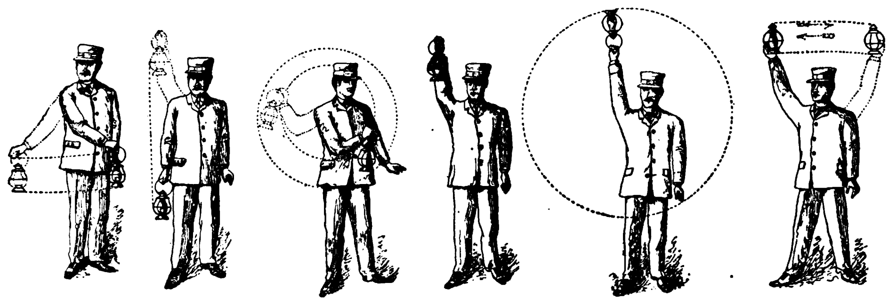
MODEL OF DOMESTIC MONEY ORDER FORM.

POSTAL SERVICE OF THE WORLD—Continued.

Foreign postal matter sent out.	Number of Letters.		Number of post cards		Printed matter.	Commercial papers.	Samples of merchand'e	Total including free matter.	Money orders paid.	
	Postage prepaid. 1	Not prepaid. 2	Single. 3	With reply paid. 4	5	6	7	8	Number. 9	Value in dollars. 10
Germany.....	153,889,070	1,713,320	64,726,040	Inc. Col. (3)	103,031,620	1,089,800	9,410,650	334,692,810	4,733,340	$54,840,825.93
Austria.......	132,280,600	2,406,970	59,311,730	491,320	65,409,060	116,860	7,619,040	270,880,830	5,239,737	57,756,866.75
Belgium......	39,507,697	176,452	14,488,730	32,047	30,805,339	322,201	2,065,835	87,505,351	763,367	11,556,913.15
Denmark.....	12,537,525	75,361	3,667,976	6,903	2,849,951	48,139	317,135	19,502,990	247,820	3,287,676.50
France.......	102,016,301	400,513	6,035,876	220,073	108,206,866	1,047,393	7,906,104	225,833,126	1,984,660	21,886,120.87
Great Britain..	165,078,000	1,693,000†	17,688,300	Inc. Col. (3)	102,603,000	Inc. Col. (5)	Inc. Col. (5)	287,062,600	852,760	14,777,775.30
Italy.........	41,080,559	1,608,112	11,588,735	121,641	23,370,833	271,968	2,016,156	80,180,401	514,569	8,695,580.26
Japan........	15,621,318	30,878	8,692,133	88,644	9,023,362	258,334	345,750	34,511,967	22,792	346,532.46
Mexico.......	11,347,651	6,266	1,532,070	5,296	4,131,059	14,449	54,301	17,285,338	169,592	3,824,020.39
Norway.......	6,656,172	73,302	1,742,404	1,955	1,593,109	43,849	92,749	10,241,019	305,453	2,359,573.99
Netherlands...	22,061,730	205,681	8,713,066	67,712	14,506,554	163,710	1,335,312	47,125,288	467,308	4,040,417.94
Portugal......	6,570,671	45,422	1,498,895	2,511	3,153,468	123,960	128,608	11,542,551	47,663*	563,403.09
Russia........	48,232,449	3,694,998	21,101,442	488,846	13,984,481	606,976	1,837,053	89,946,245	646,677	10,690,727.47
Spain.........	15,793,716	161,862	3,478,698	14,784	17,647,290	108,996	506,826	37,781,016	....	....
Sweden.......	9,406,761	199,134	2,442,934	4,745	2,162,121	61,893	163,631	14.511,627	425,789*	3,800,474.90
Switzerland...	26,995,469	443,576	21,201,796	59,744	15,408,213	236,560	1,512,565	66,115,351	1,935,271	17,098,007.03

* Includes money by telegraph. † Includes free matter.



(a) (b) (c) (d) (e) (f)

STANDARD LAMP SIGNALS ON RAILROADS.

(a) STOP — Swing crosswise of track.

(b) PROCEED—GO AHEAD—Raise up and down.

(c) BACK—Swing vertically in circle above head.

(d) RELEASE AIR BRAKE.—Hold lamp above head.

(e) TRAIN HAS PARTED.—Swing in circle at arm's length.

(f) APPLY AIR BRAKE.

ESTIMATED TOTAL MAIL DELIVERED AND COLLECTED BY RURAL DELIVERY CARRIERS ANNUALLY, BASED ON A COUNT IN MAY, 1911.

Class of matter.	Delivered.		Collected.		Total.	
	Number.	Weight.	Number.	Weight.	Number.	Weight.
First class:		*Pounds.*		*Pounds.*		*Pounds.*
Letters	402,346,951	12,224,392	260,288,602	6,086,496	722,635,553	18,310,888
Postal cards	220,824,766	2,707,168	128,116,628	1,530,636	348,941,394	4,237,804
Miscellaneous	1,488,779	303,453	302,740	65,276	1,791,519	368,729
Total	684,660,496	15,235,013	388,707,970	7,682,408	1,073,368,466	22,917,421
Second class:						
Newspapers	996,710,156	175,322,207	1,459,579	333,379	998,169,735	175,655,586
Magazines	95,318,801	29,165,207	225,608	82,890	95,544,409	29,248,097
Free in county	169,349,819	24,557,233	124,710	19,286	169,474,529	24,576,519
Transient	11,606,341	2,542,016	3,178,762	600,019	14,785,103	3,142,035
Total	1,272,985,117	231,586,663	4,988,659	1,035,574	1,277,973,776	232,622,237
Third class:						
Books	4,033,761	3,364,075	256,209	175,066	4,289,970	3,539,141
Circulars	258,855,886	20,331,815	3,804,808	271,634	262,660,694	20,603,449
Miscellaneous	34,723,736	7,840,204	1,637,869	361,915	36,361,505	8,202,119
Total	297,613,383	31,536,094	5,698,886	808,615	303,312,269	32,344,709
Fourth class:						
Merchandise packages	30,161,408	14,266,782	3,255,429	1,463,269	33,416,837	15,730,051
Franked and penalty:						
Franked letters	4,125,727	295,126	230,649	10,898	4,356,376	306,024
Franked documents	6,450,969	1,292,804	108,277	27,404	6,559,246	1,320,208
Penalty letters	11,591,630	548,580	1,060,715	58,511	12,652,345	607,091
Penalty documents	3,600,444	487,313	102,139	18,659	3,702,583	505,972
Total	25,768,770	2,623,823	1,501,780	115,472	27,270,550	2,739,295
Foreign:						
Letters	4,683,176	200,392	2,295,487	110,171	6,978,663	310,563
Miscellaneous	2,262,328	374,018	305,852	44,292	2,568,180	418,310
Total	6,945,504	574,410	2,601,339	154,463	9,546,843	728,873
Registered:						
Letters	1,165,474	119,937	734,593	65,300	1,900,067	185,237
Miscellaneous	376,651	225,557	129,617	52,718	506,268	278,275
Total	1,542,125	345,494	864,210	118,018	2,406,335	463,512
Grand total	2,319,676,803	296,168,279	407,618,273	11,377,819	2,727,295,076	307,546,098

RURAL DELIVERY.

On June 30, 1912, service was in operation on 42,199 routes served by 42,081 carriers at an annual cost of $40,655,740.

The total mileage of rural routes in operation June 30, 1912, was 1,021,492, and the daily travel by carriers was 1,012,722 miles, the average mileage per route being 24.20. The averag cost per mile traveled was $0.1307.

GROWTH OF THE SERVICE.

There were 42,199 routes in operation on June 30, 1912; of these, 699 routes were operated tri-weekly, being an increase of 91 over the previous year.

In 1897 there were 82 routes, for which an appropriation of $40,000 was made; the expenditure that year was $14,840. In 1900 there were 1,259 routes, the appropriation was $450,000, the expenditure $420,433, which was an increase of $270,421 over that of the preceding year. In 1905 the number of routes was 32,055, the appropriation $21,116,600, the expenditure $20,864,885, an excess of $8,219,610 over that of the year before. In 1912 there were 42,199 routes, the appropriation was $42,790,000, the expenditure $41,859,422, an increase of $4,733,792 over the expenditure of 1911.

AMOUNT OF MAIL HANDLED.

In May, 1911, a count was made of the amount and weight of mail of all classes delivered and collected by the rural-delivery carriers. From this count the estimate given in the table above has been made of the amount and weight of mail handled annually on rural routes.

The first aerial dispatch of United States mail occurred in September, 1911, when 43,000 pieces were carried from Aeroplane Postal Station No. 1 on Nassau Boulevard to Mineola, Long Island. The progress being made in the science of aviation encourages the hope that ultimately the regular conveyance of mail by this means may be practicable. Such a service, if found feasible, might be established in many districts where the natural conditions preclude other means of rapid transportation.

PARCELS DISPATCHED TO AND RECEIVED FROM FOREIGN COUNTRIES DURING THE FISCAL YEAR ENDING JUNE 30, 1912, AND INCREASE OVER PREVIOUS YEARS.

Country.	Dispatched				Received.			
	Number.	Per cent increase.	Weight.	Per cent increase.	Number.	Per cent increase.	Weight.	Per cent increase.
			Pounds.				*Pounds.*	
Australia	14,976	19.12	47,944	29.43	2,720	6.04	7,694	4.91
Austria	12,217	34.38	33,417	49.63	2,248	8.08	13,253	7.08
Bahamas	4,277	[1] 6.18	10,608	[1] 2.59	531	[1] 8.92	1,188	3.93
Barbados	4,822	20.27	12,085	25.91	1,132	11.30	1,888	5.77
Belgium	4,913	12.37	11,082	25.78	2,738	7.16	13,888	9.95
Bermuda	6,054	32.64	12,588	36.66	2,038	37.70	4,677	41.55
Bolivia	8,355	30.22	66,287	34.84	107	28.91	386	86.47
Brazil	7,353	322.76	30,904	315.32	102	(2)	299	(2)
British Guiana	2,237	[1] 2.31	5,608	16.13	385	14.24	774	11.52
Chile	9,566	46.31	50,219	47.42	667	6.71	2,032	[1] 13.75
China	9,835	4.82	36,084	27.64	2,665	18.76	8,075	25.19
Colombia	23,684	28.41	151,843	32.57	1,186	164.14	7,691	398.12
Costa Rica	14,827	17.26	91,920	29.07	1,589	367.35	8,211	638.39
Danish West Indies	3,290	23.54	8,475	22.35	309	56.06	788	72.05
Denmark	9,009	25.35	16,505	31.35	7,941	7.45	24,087	12.86
Dutch Guiana	380	33.80	1,093	36.79	47	27.69	119	[1] 52.96
Ecuador	7,728	32.37	46,722	43.24	308	47.36	899	46.89
France	12,820	30.18	26,987	73.22	6,520	94.22	44,218	248.72
Germany	65,078	19.39	165,725	15.34	126,463	9.46	825,189	6.51
Great Britain	189,152	13.42	328,649	17.64	137,735	18.98	613,962	31.52
Guatemala	6,795	[1] 40.39	37,853	[1] 26.18	744	552.63	3,568	659.15
British Honduras	4,100	11.93	10,071	17.03	686	175.50	1,486	217.52
Republic of Honduras	7,646	43.18	44,975	66.72	707	1,059.01	3,231	2,207.85
Haiti	1,143	69.64	3,732	113.74	45	(3)	257	(3)
Hongkong	2,293	7.50	7,533	11.27	1,760	58.41	4,894	92.22
Hungary	6,878	20.75	18,478	46.30	2,748	96.57	17,096	108.61
Italy	47,727	13.07	112,034	19.85	10,300	[1] 31.68	76,965	[1] 31.39
Jamaica	16,335	25.83	33,804	28.92	2,738	13.14	5,595	21.39
Japan	38,080	13.81	108,202	21.14	40,415	9.48	138,580	15.75
Leeward Islands	2,727	14.77	7,818	13.22	389	[1] 5.58	990	4.21
Mexico	78,529	5.44	407,529	11.57	18,657	6.19	48,690	17.94
Netherlands	4,158	23.34	9,933	21.63	1,851	77.98	7,977	100.83
Newfoundland	7,535	34.57	12,014	24.08	1,789	8.03	3,002	4.78
New Zealand	8,421	25.72	30,654	35.70	1,208	17.16	3,358	21.71
Nicaragua	6,651	24.50	36,565	26.76	328	556.00	1,520	1,025.92
Norway	16,324	14.79	28,549	24.98	14,923	3.39	35,671	23.40
Peru	8,852	25.38	53,352	36.74	536	38.86	1,351	19.45
Salvador	5,336	22.47	34,250	26.51	103	27.16	433	27.72
Sweden	23,490	14.32	46,019	38.75	7,757	16.07	30,524	58.26
Trinidad	3,734	7.70	9,827	2.75	781	1.43	1,758	10.91
Uruguay	2,206	102.56	10,536	171.19	80	19.40	236	19.79
Venezuela	7,984	20.99	48,218	28.12	194	[1] 2.51	685	[1] 9.03
Windward Islands	991	5.88	2,510	7.36	218	15.34	520	18.72
Curacao [4]	320	....	1,014	....	30	....	75	....
Total	718,828	....	2,270,215	....	406,456	....	1,967,779	....

[1] Decrease.
[2] No parcels received during year ended June 30, 1911. Convention effective May 29, 1911.
[3] No parcels received during year ended June 30, 1911. Convention effective May 1. 1911.
[4] Convention effective Jan. 1, 1912.

During the last fiscal year the Department paid $1,295,508.63 for the manufacture of stamped envelopes and newspaper wrappers. Under the new contract beginning July 1, 1912, the prices for the four-year term will be $297,880 less than the same quantities would have cost under the old contract.

The annual rate of expenditure for the salaries of presidential postmasters on July 1, 1911, was $14,566,700, as follows: First class, $1,628,900; second class, $4,576,100; third class, $8,361,700.

To reward postal employees for the invention of labor-saving devices legislation was obtained as follows:

"The Postmaster General is hereby authorized to pay, in his discretion, rewards to postal employees whose inventions are adopted for use in the postal service, and for that purpose the sum of $10,000 is hereby appropriated."

The postal service is using nearly 2,000,000,000 yards of jute twine yearly for tying packages of letters.

MAILINGS OF SECOND-CLASS PUBLICATIONS.

Totals of the number of publications of the various frequencies of issue and news agents mailing at the pound rate of postage June 30, 1912.

Daily	2,514
Tri-weekly	59
Semi-weekly	650
Weekly	17,217
Semi-monthly	567
Monthly	5,277
Bi-monthly	254
Quarterly	1,351
Other periods	255
Total	28,144
News agents	3,200
Publications admitted under the act of March 3, 1879	26,657
Publications admitted under the act of July 16, 1894	1,469
Publications admitted under the act of June 6, 1900	18
Total	28,144

Stamps were first introduced in America by the English Stamp Act of 1765; this act was opposed by the First American Congress in Nov. 1765 and repealed in 1776.

Number of pounds of second-class matter mailed at the cent-a-pound and free-in-county rates during the fiscal year ended June 30, 1912:

Subscribers' copies:	
Free in county	58,017,631
At cent-a-pound rate	927,260,451
Sample copies at cent-a-pound rate	12,679,904
Total at cent-a-pound rate	939,940,355
Total mailings at cent-a-pound rate and free-in-county	997,957,986

Estimated weights of mailings of second-class matter at other than the cent-a-pound and free-in-county rates during the fiscal year 1912, based on the special weighing of mails in 1907:

	Pounds.
At transient second-class rate of 1 cent for each 4 ounces	29,494,990
At special rate of 1 cent a copy	1,825,482
At special rate of 2 cents a copy	3,732,097
Total	35,052,569

RECAPITULATION.

Weight of mailings of second-class matter at the cent-a-pound and free-in-county rates	997,957,986
Weight of mailings at other rates	35,052,569
Aggregate weight of mailing of second-class matter	1,033,010,555

REGISTERED MAIL ITEMS WITH TOTAL AMOUNTS FOR THE YEAR ENDING JUNE 30, 1912.

Paid registrations:	
Domestic letters	25,761,638
Domestic parcels	7,295,130
Foreign letters	3,924,637
Foreign parcels	777,762
Official paid	154,567
Total paid registrations	37,913,734
Official free, inclusive of postal savings system	4,095,987
Official free, on business of postal savings system only	79,556
Official free (special)	145,723
Total free registrations	4,321,266
Total number of letters and parcels registered, paid and free	42,235,000
Distribution letters and parcels re-registered free	1,385,498
Aggregate number of letters and parcels registered, paid, official free, and distribution free	43,620,498
Total free and distribution registered free	5,706,764
Amount collected for registry fees	3,791,373.40

GROWTH OF THE DOMESTIC MONEY-ORDER SYSTEM.

For the year ending June 30, 1912, the total number of money-order offices in operation was 52,815; the number of orders issued was 84,539,212, their value $583,337,003.96; the number of orders paid and repaid, 84,686,907; their value $584,358,032.94; the number of excess of payments and repayments over issues, 147,695, their value $1,021,028.98; the amount in fees received, $4,967,746.84; average amount of orders, $6.90; average amount of fees, $0.0582.

STAMP BOOKS.

During the fiscal year ending June 30, 1912, 25,736,946 stamp books were issued, having a value of $8,145,512.34.

STAMP COILS.

During the fiscal year ending June 30, 1912 459,204 stamp coils were issued for use in stamping machines. The total value of the stamps which were made up in coils was $4,363,273.60.

POSTAL CARDS.

During the fiscal year ending June 30, 1912, 909,411,045 postal cards were issued, having a value of $9,326,562.40. By far the largest number of postal cards were the one-cent card bearing a portrait of the late President McKinley. There were 944,927,198 cards issued of this variety in 1911.

STAMPED ENVELOPES AND NEWSPAPER WRAPPERS.

During the fiscal year ending June 30, 1912, 449,248,500 ordinary stamped envelopes and wrappers were issued, the value being $158,777.72, while 1,235,375,661 return card envelopes were issued, having a value of $25,546,037.55, making a total of 1,684,624,161, with a value of $33,704,815.27.

Fees of 8 cents each on special delivery mail were claimed by postmasters last year to the total amount of $1,469,177.80, indicating that 18,364,722 pieces of mail of this character were delivered, being an increase of 1,608,223 pieces over last year, or 9.58 per cent. These figures relate to all post offices, irrespective of class.

IMITATIONS OF STAMPS.

No adhesive stamps, of any form or design whatever, other than lawful postage stamps, are permitted to be affixed to the address side of domestic mail matter, but such adhesive stamps, provided they do not in form resemble lawful postage stamps, and do not bear numerals, may be affixed to the reverse side of domestic mail matter.

PART II.

PRACTICAL POSTAL INFORMATION.

DOMESTIC MAIL MATTER.

CLASSIFICATION.

1. Domestic mail matter includes matter deposited in the mails for local delivery, or for transmission from one place to another within the United States, or to or from or between the possessions of the United States, and is divided into four classes:

First. Written and sealed matter, postal cards and private mailing cards.

Second. Periodical publications. (Rates for publishers and news agents only.)

Third. Miscellaneous printed matter (on paper).

Fourth (Parcel Post). All matter not included in previous classes.

2. Porto Rico and Hawaii are included in the term "United States." The Philippine Archipelago, Guam, Tutuila (including all adjacent islands of the Samoan group which are possessions of the United States), and the Canal Zone are included in the term "Possessions of the United States." The term "Canal Zone" includes all the territory purchased from the Republic of Panama, embracing the "Canal Zone" proper and the islands in the Bay of Panama named Perico, Naos, Culebra and Flamenco.

3. Domestic rates and conditions apply to mail matter addressed to officers or members of the crew of vessels of war of the United States, to matter sent to the United States Postal Agency at Shanghai, China, and, with certain exceptions, to that sent to Canada, Cuba, Mexico and the Republic of Panama. The domestic rate applies also to letters, but not to other articles, addressed to Great Britain, Ireland and Newfoundland, and to letters for Germany despatched only by steamers which land the mails at German ports.

4. Pamphlet of General Postal Information.—A pamphlet of general postal information has been issued for free distribution to the public through postmasters. It contains the classification, conditions and postage rates for domestic and foreign mail matter. The information given herewith is usually sufficient. A new edition of the pamphlet has just been issued.

FIRST-CLASS MATTER.

5. Written matter, namely: Letters, postal cards, private mailing cards (post cards), and all matter wholly or partly in writing, whether sealed or unsealed (except manuscript copy accompanying proof sheets or corrected proof sheets of the same) and the writing authorized by law to be placed upon matter of other classes. All matter sealed or otherwise closed against inspection is also of the first class. Note.—Typewriting and carbon and letter press copies thereof are held to be an equivalent of handwriting and are classed as such in all cases.

DROP LETTERS.

6. See page 336.

POSTAL CARDS.

7. Postal cards issued by the Post Office Department may bear written, printed, or other additions as follows:

(a) The face of the card may be divided by a vertical line placed approximately one-third of the distance from the left end of the card; the space to the left of the line to be used for a message, etc., but the space to the right for the address only.

(b) Addresses upon postal cards . . . may be either written, printed or affixed thereto, at the option of the sender.

(c) Very thin sheets of paper may be attached to the card on condition that they completely adhere thereto. Such sheets may bear both writing and printing.

(d) Advertisements, illustrations or writing may appear on the back of the card and on the left third of the face.

(e) The addition to a postal card of matter other than as above authorized will annul its privileges as a postal card and subject it, when sent in the mails, to postage according to the character of the message—at the letter rate if wholly or partly in writing or the third-class rate if entirely in print. In either case the postage value of the stamp impressed upon the card will not be impaired.

(f) Postal cards must be treated in all respects as sealed letters, except that when undeliverable to the addressee they may not be returned to the sender. Undeliverable "double" postal cards will be returned to the sender if known.

(g) Postal cards bearing particles of glass, metal, mica, sand, tinsel or other similar substances are unmailable, except when enclosed in envelopes tightly sealed to prevent the escape of such particles with proper postage attached, or when treated in such manner as will prevent the objectionable substances from being rubbed off or injuring persons handling the mails.

Note.—Used postal cards which conform to the conditions prescribed for post cards may be remailed with one cent postage prepaid thereon.

8. Double postal cards should be folded before mailing. Intact double postal cards should be folded before mailing.

9. Either Half Usable Separately.—Either half of a double domestic postal card may be used separately, but postmasters will not separate them.

10. Mailing Reply Part With Initial Half Attached.—If the initial half of a double postal card be not detached when the reply half is mailed for return, the card is subject to postage according to the character of the message. The enclosure in a double postal card of unauthorized matter annuls its privileges as a postal card.

11. Reply Postal Cards to and from the Philippines.—The reply half of the Philippine double postal card of 1-cent denomination, overprinted with the word Philippine, shall be valid for postage when mailed in the United States and addressed to points in the Philippine Islands. The United States 1-cent double postal card may be mailed from the United States to the Philippine Islands, and by arrangement with the Bureau of Posts of the Philippines the reply half of the card is valid for postage when mailed in the Philippines and addressed to points in this country.

PRIVATE MAILING CARDS (POST CARDS).

12. Private mailing cards ("post cards") in the domestic mails must conform to the following conditions:

(a) A "post card" must be an unfolded piece

of cardboard not exceeding 9 by 14 centimeters (approximately 3 9-16 by 5 9-16 inches) nor less than 7 by 10 centimeters (approximately 2 3-4 by 4 inches).

(b) It must in form and in the quality and weight of paper be substantially like the Government postal card.

(c) It may be of any color not interfering with a legible address and postmark.

(d) It may or may not, at the option of the sender, bear near the top of the face the words "Post Card."

(e) The face of the card may be divided by a vertical line; the left half to be used for a message, etc., but that to the right for the address only.

(f) Very thin sheets of paper may be attached to the card, and then only on condition that they completely adhere thereto. Such sheets may bear both writing and printing.

(g) Advertisements and illustrations may appear on the back of the card and on the left half of the face.

(h) Cards, without cover, conforming to the foregoing conditions, are transmissible in the domestic mails (including the possessions of the United States) and to Cuba, Canada, Mexico, the Republic of Panama, and the United States postal agency at Shanghai, China, at the postage rate of 1 cent each.

(i) When post cards are prepared by printers and stationers for sale it is desirable that they bear in the upper right-hand corner of the face an oblong diagram containing the words "Place postage stamp here," and at the bottom of the space to the right of the vertical dividing line the words "This space for the address."

(j) Cards which do not conform to the conditions prescribed by these regulations are, when sent in the mails, chargeable with postage according to the character of the message—at the letter rate if wholly or partly in writing, or at the third-class rate if entirely in print.

(k) Cards bearing particles of glass, metal, mica, sand, tinsel or other similar substances are unmailable, except when enclosed in envelopes tightly sealed to prevent the escape of such particles, or when treated in such manner as will prevent the objectionable substances from being rubbed off or injuring persons handling the mails. Cards mailed under cover of sealed envelopes (transparent or otherwise) are chargeable with postage at the first-class rate; if enclosed in unsealed envelopes they are subject to postage according to the character of the message—at the first-class rate if wholly or partly in writing, or the third-class rate if entirely in print; and the postage stamps should be affixed to the envelopes covering the same. Postage stamps affixed to matter enclosed in envelopes cannot be recognized in payment of postage thereon.

ARTICLES INCLUDED IN FIRST-CLASS MATTER.

13. Assessment notices (printed) with amount due written therein. Albums (autograph) containing written matter. Blank books with written entries; bank checks filled out in writing, either canceled or uncanceled; legal and other blank printed forms signed officially. Blank forms, filled out in writing. Cards or letters (printed) bearing a written date, where the date is not the date of the card, but gives information as to when the sender will call or deliver something otherwise referred to, or is the date when something will occur or is acknowledged to have been received. Cards (printed) which by having a signature attached are converted into personal communications, such as receipts, orders for articles furnished by addressee, etc. Cards (visiting) bearing written name, except single cards enclosed with third or fourth class matter, and bearing the name of the sender. Certificates, checks, receipts, etc., filled out in writing. Communications entirely in print, with exception of name of sender, sent in identical terms by many persons to the same address. Copy (manuscript or typewritten) unaccompanied by proof sheets thereof. Diplomas, marriage or other certificates, filled out in writing. Envelopes bearing written addresses. Folders made of stiff paper, the entire inner surface of which cannot be examined except at the imminent risk of breaking the seal, and those having many folds or pages, requiring the use of an instrument of any kind in order to thoroughly examine the inner surfaces are subject to the first-class rate of postage. Hand or typewritten matter and letter press or manifold (carbon) copies thereof. Imitations or reproductions of hand or typewritten matter not mailed at the post office window or other depository designated by the postmaster in a minimum number of twenty identical copies. Legal and other blank printed forms signed officially. Letters (old or re-mailed) sent singly or in bulk. Manuscripts or typewritten copy, when not accompanied by proof sheets thereof. Marriage certificates filled out in writing. Old letters sent singly or in bulk. Original typewritten matter and manifold or letter-press copies thereof. Price lists (printed) containing written figures changing individual items. Receipts (printed) with written signatures. Sealed matter of any class, or matter so wrapped as not to be easily examined, except original packages of proprietary articles of merchandise put up so that each package may be examined in its simplest mercantile or sample form, and seeds and other articles that may be enclosed in sealed transparent envelopes. Stenographic or shorthand notes. Typewritten matter, original letter-press and manifold copies thereof. Unsealed written communications. Visiting cards (written), except single cards enclosed with third or fourth class matter, and bearing the name of the sender.

SECOND-CLASS MATTER.

14. Includes newspapers and periodicals bearing notice of entry as second-class matter. A pamphlet containing the laws governing mailable matter of the second class and regulations thereunder will be furnished postmasters, interested publishers and news agents.

THIRD-CLASS MATTER.

15. Printed matter under the following conditions is third-class matter:

16. Printed Matter Defined.—Printed matter is the reproduction upon paper by any process, except handwriting and typewriting, not having the character of actual personal correspondence, of words, letters, characters, figures or images, or any combination thereof. Matter produced by the photographic process (including blueprints) is printed matter.

17. Circulars.—A circular is defined by law to be a printed letter which, according to internal evidence, is being sent in identical terms to several persons. A circular may bear a written, typewritten or hand-stamped date, name and address of person addressed and of the sender, and corrections of mere typographical errors.

18. Where a name (except that of the addressee or sender), date (other than that of the circular), figure, or anything else is written, typewritten or hand stamped in the body of the circular for any other reason than to correct a genuine typographical error, it is

subject to postage at the first-class (letter) rate, whether sealed or unsealed.

19. Exception.—If such name, date or other matter be hand stamped, and not of a personal nature, the character of the circular as such is not changed thereby.

20. Reproductions or imitations of handwriting and typewriting obtained by means of the printing press, neostyle, hectograph, multigraph, or similar process, will be treated as third-class matter, provided they are mailed at the post office window or other depository designated by the postmaster in a minimum number of 20 perfectly identical, unsealed copies. If mailed in a less quantity they will be subject to the first-class rate.

21. Correspondence of the blind; mailable at the third-class rate.

22. Seeds, bulbs, roots, scions, etc.; mailable at the third-class rate of postage.

22a. Identical pieces of third-class matter mailed without stamps affixed.

ARTICLES INCLUDED IN THIRD-CLASS MATTER.

23. Address tags and labels (printed). Advertisements printed on blotting paper. Almanacs. Architectural designs (printed). Assessment notices, wholly in print. Blank notes (printed). Blanks (printed legal) and forms of insurance applications, mainly in print. Blind, indented or perforated sheets of paper containing characters which can be read by the blind, except such as are entitled to free transmission. Blue prints. Books (printed). Bulbs. Calendar pads mainly in print. Calendars (printed on paper). Canvassing and prospectus books with printed sample chapters. Cards printed on paper. Cards, printed, with perforations for carrying coin. Cards, Christmas, Easter, etc., printed on paper. Catalogues. Check and receipt books (mainly in print). Circulars. Clippings (press) with name and date of paper stamped or written in. Correspondence of the blind. Coupons, printed. Engravings and wood cuts (printed on paper). Grain in its natural condition (samples of). Imitations of hand or typewritten matter, when mailed at the post office window or other depository designated by the postmaster in a minimum number of 20 identical copies. Indented or perforated sheets of paper containing characters which can be read by the blind, except such as are entitled to free transmission. Insurance applications and other blank forms mainly in print. Labels and tags bearing printed addresses. Legal blanks (printed) and forms of insurance applications, mainly in print. Lithographs. Maps printed upon paper, with the necessary mountings. Memorandum books, mainly in print. Music books. Newspaper "headings" or clippings. Notes (blank printed). Order blanks and report forms, mainly in print. Photographs, printed on paper. Plans and architectural designs (printed). Plants, Postage stamps (cancelled or uncancelled). Postal cards, bearing printed advertisements, mailed in bulk. Post cards, bearing on the message side illustrations or other printed matter, mailed in bulk. Press clippings with name and date of paper stamped or written in. Price lists, wholly in print. Printed blank notes. Printed calendars. Printed labels. Printed plans and architectural designs. Printed tags and labels. Printed valentines. Proof-sheets (printed) with or without manuscript. Receipt and check books (mainly in print). Reproductions or imitations of hand or typewriting, by the neostyle, hectograph, mimeograph, electric pen, or similar process, when mailed at the post office window or other depository designated by the postmaster, in a minimum number of twenty identical copies. Roots. School copy books containing printed instructions. Scions. Seeds. Sheet music. Tags and labels, printed. Valentines, printed on paper. Visiting cards (printed). Wood cuts and engravings (prints).

24. Permissible additions to third-class matter:—

(a) Such words as "Dear Sir," "My dear friend," "Yours truly," "Sincerely yours," "Merry Christmas," "Happy New Year," "With best wishes" and "Do not open until Christmas," or words to that effect, written upon third class matter are permissible inscriptions.

(b) Inscriptions in public library books.—Public library books, otherwise transmissible in the mails at the third-class rate of postage, shall not be subjected to a higher postage rate because of bearing thereon or therein, in writing or by means of hand-stamp, the shelf-number, date of donation or acquisition (or both), or any mark of designation which may be reasonably construed as an "inscription" within the meaning of the law in the limited sense of a permanent library record, placed thereon by the librarian and in that connection only.

(c) A written designation of contents—such as "Book," "Printed matter," "Photo"—shall be construed as a permissible "inscription" upon mail matter of the third class.

(d) Incidental use of third-class matter as receptacles for coin.—The rate of postage on matter essentially third class (printed matter upon paper) is not affected by the fact that incidentally it contains a perforation which may be used for carrying coin.

(e) Serial numbers.—Serial numbers written or impressed upon, and so inserted in what would otherwise be third-class matter, do not increase that rating.

(f) Permissible enclosures.—"There may be enclosed with third-class matter, without changing the classification thereof, a single visiting or business card; a single printed order-blank, or a single printed combination order-blank and coin-card with envelope bearing return address; or a single postal card bearing return address."

FOURTH-CLASS (PARCEL POST) MATTER.

25. Fourth-class matter is all mailable matter not included in the three preceding classes which is so prepared for mailing as to be easily withdrawn from the wrapper and examined, except that sealed packages of proprietary articles of merchandise (not in themselves unmailable), such as pills, fancy soaps, tobacco, etc., put up in fixed quantities by the manufacturer for sale by himself or others, or for samples, in such manner as to properly protect the articles, so that each package in its simplest mercantile or sample form may be examined, are mailable as fourth-class matter. It embraces merchandise and samples of every description, and coin or specie.

26. Postage must be paid by stamps affixed, unless 2,000 or more identical pieces are mailed at one time when the postage at that rate may be paid in money. New postage must be prepaid for forwarding or returning. The affixing of special delivery ten-cent stamps in addition to the regular postage entitles fourth-class matter to special delivery.

Articles of this class liable to injure or deface the mails, such as glass, sugar, needles, nails, pens, etc., must be first wrapped in a bag, box, or open envelope and then secured in another outside tube or box, made of metal or hard wood, without sharp corners or edges, and having a sliding clasp or screw lid, thus

securing the articles in a double package. The public should bear in mind that the first object of the department is to transport the mails safely, and every other interest is made subordinate.

ARTICLES INCLUDED IN FOURTH-CLASS MATTER.

27. Albums, photograph and autograph (blank). Artificial flowers. Bees (queen) when properly packed. Bill heads. Blank address tags and labels. Blank books. Blank books with printed headings. Blank cards or paper. Blank diaries. Blank postal cards in bulk packages. Blank post-cards. Blotting paper (blank). Botanical specimens, not susceptible of being used for propagation. Calendar pads, mainly blank. Calendars or other matter printed on celluloid. Card coin-holders (not printed). Cards (blank). Cards, printed playing, of all kinds. Celluloid, printed or unprinted. Check books, mainly blank. Christmas and Easter cards printed on other material than paper. Cigar bands. Coin. Combination calendar and memorandum pads, mainly blank. Crayon pictures. Cut flowers. Cuts (wood or metal). Daguerreotypes. Dissected maps and pictures. Drawings, framed or unframed. Dried fruit. Dried plants. Easter cards, when printed on other material than paper. Electrotype plates. Engravings, when framed. Envelopes, printed or unprinted, except when addressed and enclosed singly with third-class matter. Flowers, cut or artificial. Framed engravings, pictures and other printed matter. Geological specimens. Grain, not intended for planting. Letter heads. Maps, printed on cloth. Merchandise samples. Memorandum books and calendar pads, mainly blank. Merchandise sealed: Proprietary articles (not in themselves unmailable), such as pills, fancy soaps, tobacco, etc., put up in fixed quantities by the manufacturer for sale by himself or others, or for samples, in such manner as to properly protect the articles, and so that each package in its simplest mercantile or sample form may be readily examined. Metals. Minerals. Napkins, paper or cloth, printed or unprinted. Oil paintings, framed or unframed. Order blanks and report forms, mainly blank (spaces covered by ruled lines being regarded as blank), are fourth-class matter. However, one copy may be enclosed with third-class matter without subjecting such matter to postage at the fourth-class rate. Paper bags and wrapping paper, printed or unprinted. Paper napkins, Patterns, printed or unprinted. Pen or pencil drawings. Photograph albums. Photographic negatives. Postal cards (blank) in bulk packages. Post-cards (blank). Printed matter on other material than paper. Printed playing cards of all kinds. Private mailing or post-cards (blank). Queen bees, when properly packed. Record books, mainly blank. Rulers, wooden or metal, bearing printed advertisements. Samples of cloth. Samples of flour or other manufactured grain for food purposes. Sealed merchandise: Soap wrappers. Stationery. Tags (blank). Tape measures. Tintypes. Valentines printed on material other than paper. Wall paper. Water color painting. Wooden rulers, bearing printed advertisements. Wrapping paper, printed or unprinted.

28. Permissible writing or printing upon or with fourth-class matter:

(a) The written additions permissible upon third-class matter may be added to fourth-class matter without subjecting the latter to a higher than the fourth-class rate of postage.

(b) The written additions permissible upon fourth-class matter may be placed upon the matter itself, or upon the wrapper or cover thereof, or tag or label accompanying the same.

(c) A written designation of the contents, such as "candy," "cigars," "merchandise," etc., is permissible upon the wrapper of fourth-class matter.

(d) Such inscriptions as "Merry Christmas," "Happy New Year," "With best wishes," and "Do not open until Christmas," or words to that effect, together with the name and address of the addressee and of the sender may be written on mail matter of the fourth class, or upon a card enclosed therewith, without affecting its classification.

RATES OF POSTAGE.

FIRST-CLASS MATTER.

Rates of postage on first-class matter. —(a) On letters and other matter, wholly or partly in writing, except the writing specially authorized to be placed upon matter of other classes, and on matter sealed or otherwise closed against inspection—2 cents an ounce or fraction thereof.

(b) On postal cards—1 cent each, the price for which they are sold.

(c) On private mailing cards (post-cards) conforming to the requirements of Postal Laws and Regulations—1 cent each.

(d) On "drop letters," 2 cents an ounce or fraction thereof when mailed at letter-carrier post offices, or at offices which are not letter-carrier offices if rural free delivery has been established and the persons addressed can be served by rural carrier; and 1 cent for each ounce or fraction thereof when mailed at offices where letter-carrier sevice is not established, or at offices where the patrons cannot be served by rural free-delivery carriers.

(e) Letters mailed at a post office for delivery to patrons thereof by star route carrier and those deposited in boxes along a star route or rural free delivery route are subject to postage at the rate of two cents an ounces or fraction thereof.

(f) Letters prepaid 1 cent received by a postmaster, under cover (through the mails), with postage prepaid on the bulk package at the letter rate, cannot be distributed for local delivery or transmission in the mails. Each letter must be prepaid at the regular first-class rate.

(g) A letter which—after a proper effort has been made to deliver it—is returned to the sender, may not be remailed without a new prepayment of postage, and it should be enclosed in a new envelope, to secure prompt transmission.

SECOND-CLASS MATTER.

When mailed by the public.—The rate of postage on newspapers and periodical publications of the second class, when sent by others than the publisher thereof, or a news agent, is 1 cent for each 4 ounces, or fractional part thereof, on each separately addressed copy or package of unaddressed copies, to be prepaid by stamps affixed.

NOTE.—There is no such rate of postage as 4 cents a pound.

When mailed by publishers or news agents.—Copies of publications admitted to the second class of mail matter when mailed by the publishers thereof to subscribers and as sample copies within the limitations of section 436 Postal Laws and Regulations, are subject to postage at the rate of 1 cent a pound to be prepaid in money on the bulk weight of all copies, except as provided by section 433, Postal Laws and Regulations.

THIRD-CLASS MATTER.

The rate of postage on mail matter of the third class is 1 cent for each 2 ounces or fraction thereof, on each individually addressed piece or parcel, prepaid by stamps affixed, except as provided by section 459, Postal Laws and Regulations.

NOTE.—There is no such rate of postage as 8 cents a pound.

FOURTH-CLASS (PARCEL POST) MATTER.

See Pages 340 and 342.

MONEY ORDER SYSTEM.

Fees charged for money orders issued on domestic form.—

TABLE NO. 1.

Payable in the United States (which includes Guam, Hawaii, Porto Rico and Tutuila, Samoa); or payable in Bermuda, British Guiana, British Honduras, Canada, Canal Zone (Isthmus of Panama), Cuba, Mexico, Newfoundland, at the United States Postal Agency at Shanghai (China), in the Philippine Islands, or the following islands in the West Indies: Antigua, Bahamas, Barbados, Dominica, Grenada, Jamaica, Martinique, Montserrat, Nevis, St. Kitts, St. Lucia, St. Vincent, Trinidad and Tobago, and Virgin Islands.

For orders from \$ 0.01 to \$ 2.50	3 cents
For orders from \$ 2.51 to \$ 5.00	5 cents
For orders from \$ 5.01 to \$10.00	8 cents
For orders from \$10.01 to \$20.00	10 cents
For orders from \$20.01 to \$30.00	12 cents
For orders from \$30.01 to \$40.00	15 cents
For orders from \$40.01 to \$50.00	18 cents
For orders from \$50.01 to \$60.00	20 cents
For orders from \$60.01 to \$75.00	25 cents
For orders from \$75.01 to \$100.00	30 cents

21. Postmasters at domestic money-order offices must bear in mind that they are not authorized to issue money orders for payment in any foreign country other than those enumerated above. When an intending remitter applies at a domestic office for a money order payable in any other foreign country the postmaster should direct him to the nearest international money-order office.

22. Fees charged for money orders issued on international form.—

TABLE NO. 2.

Payable in Apia, Austria, Belgium, Bolivia, Cape Colony, Costa Rica, Denmark, Egypt, Germany, Great Britain and Ireland, Honduras, Hongkong, Hungary, Italy, Japan, Liberia, Luxemburg. Natal and Zululand, New South Wales, New Zealand, Orange River Colony, Peru, Portugal, Queensland, Russia, Salvador, South Australia, Switzerland, Tasmania, the Transvaal, Uruguay and Victoria, Western Australia.

For orders from \$ 0.01 to \$ 2.50	10 cents
For orders from \$ 2.51 to \$ 5.00	15 cents
For orders from \$ 5.01 to \$ 7.50	20 cents
For orders from \$ 7.51 to \$10.00	25 cents
For orders from \$10.01 to \$15.00	30 cents
For orders from \$15.01 to \$20.00	35 cents
For orders from \$20.01 to \$30.00	40 cents
For orders from \$30.01 to \$40.00	45 cents
For orders from \$40.01 to \$50.00	50 cents
For orders from \$50.01 to \$60.00	60 cents
For orders from \$60.01 to \$70.00	70 cents
For orders from \$70.01 to \$80.00	80 cents
For orders from \$80.01 to \$90.00	90 cents
For orders from \$90.01 to \$100.00	\$1.00

TABLE NO. 3.

Payable in any foreign country with which the United States exchanges money orders not enumerated in Tables Nos. 1 and 2 above.

For orders from \$ 0.01 to \$ 10.00	10 cents
For orders from \$10.01 to \$ 20.00	20 cents
For orders from \$20.01 to \$ 30.00	30 cents
For orders from \$30.01 to \$ 40.00	40 cents
For orders from \$40.01 to \$ 50.00	50 cents
For orders from \$50.01 to \$ 60.00	60 cents
For orders from \$60.01 to \$ 70.00	70 cents
For orders from \$70.01 to \$ 80.00	80 cents
For orders from \$80.01 to \$ 90.00	90 cents
For orders from \$90.01 to \$100.00	\$1.00

International orders.—There are now in operation conventions for the exchange of money orders between the United States and sixty-two countries named below:

*Antigua.	Liberia.
Apia, Samoa.	Luxemburg.
Austria.	*Martinique.
*Bahama Islands.	*Mexico.
*Barbados.	*Montserrat.
Belgium.	†Natal and Zululand.
*Bermuda.	Netherlands.
Bolivia.	*Nevis.
*British Guiana.	*Newfoundland.
*British Honduras.	New South Wales.
*Canada.	New Zealand.
*Canal Zone.	Norway.
†Cape Colony.	†Orange River Colony.
Chili.	Peru.
Costa Rica.	*Philippine Islands.
*Cuba.	Portugal.
Denmark.	Queensland.
*Dominica.	Russia.
Egypt.	*St. Kitts.
France, Algeria and Tunis.	*Saint Lucia.
Germany.	*Saint Vincent.
Great Britain and Ireland.	Salvador.
Greece.	South Australia.
*Grenada.	Sweden.
Honduras (Republic).	Switzerland.
Hongkong (China).	Tasmania.
Hungary.	†The Transvaal.
Italy (including San Marino).	*Trinidad and Tobago.
*Jamaica.	Uruguay.
Japan.	Victoria.
	*Virgin Islands.
	Western Australia.

* Draw orders on domestic money-order form.

† Cape Colony, Transvaal, Orange River Colony and Natal (with Zululand) have been consolidated into the South African Union, and all money-orders for payment in those countries are now certified by the Exchange office at New York to the Exchange office at Cape Town. Money orders to and from Natal and Zululand formerly were reissued at London. Payment may now be made on the original orders, provided the corresponding advices have been duly certified.

INTERNATIONAL REPLY-COUPONS.

International reply-coupons, of the denomination of 6 cents each, are issued for the purpose of sending to correspondents abroad. The foreign correspondent may exchange each coupon for postage stamps of the country in which he is located, equal in value to 5 cents in United States money, using the stamps for reply postage. The countries in which the reply-coupon is valid are as follows:

Argentine Republic.
Austria and the Austrian post offices in the Levant.
Chili.
Belgium.
Corea.
Bosnia-Herzegovina.
Costa Rica.
Brazil.
Crete.
Bulgaria.
Cuba.
Denmark, including Greenland, Iceland and the Faroe Islands; the Danish West Indies.
Egypt.

France, the French post offices in China, Morocco, and Turkey; the French colonies of Algeria, Dahomey, Guadeloupe and dependencies, Guiana (French), Guinea (French), Indo-China, Ivory Coast, Martinique, Mauretania, New Caledonia, Oceanica, St. Pierre-Miquelon, Senegal, Senegal-Niger; French establishments in India.

Germany, the German protectorates and German post offices in Africa, Asia, Australasia, and Turkey.

Great Britain, British post offices in Morocco and Turkey; British colonies of Australia, Bahamas, Bechuanaland, Canada, Cape of Good Hope, Ceylon, Cook Islands, Dominica, East Africa, Gibraltar, Gold Coast, Honduras (British), Hong Kong and Hong Kong offices in China, India, Labuan, Malta, Mauritius Islands, Natal, Newfoundland, New Guinea, New Zealand, Papua, Seychelles, Sierra Leone, Somaliland, Southern Nigeria, South Rhodesia, Straits Settlements, Tasmania, Transvaal, Trinidad, Uganda, Zululand; British Protectorates of the Solomon, Gilbert and Ellice Islands.

Greece.
Honduras (Republic of).
Haiti.
Hungary.
Italy, and Italian colonies of Benadir and Erythrea.
Japan and Japanese post offices in China and Manchuria.
Luxemburg.
Liberia.
Mexico.
Netherlands, Netherlands Guiana, the Netherlands Indies.
Norway.
Portugal, including the Azores and Madeira.
Roumania.
Sweden.
Salvador.
Switzerland.
Siam.
Tunis.
Spain.
Turkey.

Persons who buy the reply coupons should inform their correspondents abroad that the reply coupon is not itself good for postage, but must be exchanged at the post office for a postage stamp. The postmark of the selling post office must be stamped legibly in the circle on the left-hand side of all reply coupons sold to the public.

DELIVERY AND FORWARDING OF REGISTERED MAIL

Either the sender or the addressee of domestic registered mail may restrict its delivery. Registered mail which is not restricted in delivery may be delivered to any responsible person who customarily receives the ordinary mail of the addressee.

All registered matter, except that which has once been properly delivered, may be forwarded without additional charge for registry fee, upon the written request of any person to whom it is deliverable. In cases of emergency, when the postmaster is satisfied that no fraud is intended, a telegraphic order from the addressee may be honored.

Written orders to forward mail, signed by addressees or their agents duly authorized to control such matter, must be construed to apply to both ordinary and registered mail, unless such orders specifically state that registered mail shall not be so forwarded, or separate and special written orders are furnished directing other disposition of registered mail.

REGISTRY RETURN RECEIPT TO BE FURNISHED ONLY WHEN REQUESTED BY THE SENDER.

Section 3928 of the Revised Statutes reads as follows:

"Whenever the sender shall so request, a receipt shall be taken on the delivery of any registered mail matter, showing to whom and when the same was delivered, which receipt shall be returned to the sender and be received in the courts as prima facie evidence of such delivery."

In accordance with this statute postmasters do not prepare receipt cards for return to the senders of domestic registered mail which does not bear the indorsement "Receipt desired" or words of similar import. When an article bearing such indorsement is received for registration, the registration receipt issued to the sender and the registration record are required to be similarly indorsed.

See page 340 relative to return receipts for insured domestic parcel post mail.

REGISTRATION FEES.

The fee for the registration of mail matter, foreign and domestic, is fixed at ten cents for each piece, in addition to postage, and both postage and fee must be prepaid at the time of registration.

Fourth-class (domestic parcel post) matter may not be registered, but may be insured against loss in the mails by the prepayment of a fee of ten cents in postage stamps, to be affixed to each parcel. See page 340.

The Department has discontinued the issuance of the special ten-cent registry stamp. No further supply of this stamp shall be printed. The registry fee may be prepaid by means of any stamps which are valid for the prepayment of postage.

INDEMNITY FOR REGISTERED MAIL.

Indemnity will be paid on account of the loss of registered mail in the postal service:

(a) For the value of domestic registered mail of the first class (sealed) up to $50.

(b) For the value of domestic registered mail of the third class, unsealed, up to $25.

See page 340 in regard to indemnity for lost insured and C. O. D. parcels.

(c) In any amount claimed, within the limit of 50 francs (approximately $9.65), on account of the loss, in the international mails, of a

registered article of any class, regardless of its value, exchanged between the United States and any country embraced within the Universal Postal Union, except on account of losses arising under circumstances beyond control ("force majeure") and international "Parcels Post" registered mail.

First-class domestic matter must be sealed before being registered.

FOREIGN MAILS.

POSTAGE RATES ON ARTICLES FOR CANADA, CUBA, MEXICO, THE REPUBLIC OF PANAMA, THE UNITED STATES POSTAL AGENCY AT SHANGHAI AND THE UNITED STATES NAVAL HOSPITAL AT YOKOHAMA, JAPAN.

Articles addressed for delivery in Canada, Cuba, Mexico and the Republic of Panama are subject to the same postage rates and conditions which would apply to them if they were addressed for delivery in the United States: Except that:

(a) Letters and postal cards must be dispatched to Canada and Mexico if prepaid one full rate of postage and to Cuba and Panama whether prepaid or not. Other articles for Cuba and Panama must be prepaid at least in part and for Canada and Mexico in full.

(b) "Prints," "samples" and "commercial papers" may be sent subject to the postage rates, weight limit and other conditions applicable to similar articles in Postal Union mails.

(c) Articles other than letters in their usual and ordinary form are excluded from the mails, unless they are so wrapped that their contents can be easily examined by postmasters and customs officers. Any article enclosed in an envelope, as the word "envelope" is generally used, without regard to its size, is considered to be "in the usual and ordinary form" of a letter. But unsealed packages may contain, in sealed receptacles, articles which cannot be safely transmitted in unsealed receptacles, provided the contents of the closed receptacles are plainly visible or are precisely stated on the covers of the closed receptacles and that the package is so wrapped that the outer cover can be easily opened.

Packages of fourth-class matter that weigh over four ounces and not over four pounds six ounces may be sent to Canada, Cuba, Mexico and the Republic of Panama, at the eighth zone rate of postage (see Page 340). The parcels for Mexico and the Republic of Panama must be accompanied by customs declarations.

Unmailable.—The following articles are unmailable under any condition, viz.:

All sealed packages which, from their form and general appearance, evidently are not letters; publications which violate the copyright laws of the country of destination; poisons, explosive or inflammable substances; live or dead (not dried) animals, insects (except bees) and reptiles; fruits and vegetables which quickly decompose, and substances which exhale a bad odor; lottery tickets or circulars; all obscene or immoral articles, articles which may destroy or damage the mails, or injure the persons handling them; and to Cuba and the Republic of Panama, liquids and fatty substances, except samples thereof.

The domestic postage rates and conditions of Canada, Cuba, Mexico and the Republic of Panama apply to articles mailed in those countries addressed for delivery in the United States. Consequently articles (except sealed packages which are not letters) mailed in any one of those countries which are entitled to pass in the domestic mails of that country free of postage, are likewise entitled to transmission free of postage to the United States.

Prepayment of postage upon any article mailed in the United States, except the reply half of a double postal card, can be effected only by means of United States postage stamps.

Postage due: Postage due upon articles exchanged with these countries insufficiently prepaid, is collectible upon delivery at the single rate.

SECOND-CLASS MATTER FOR CANADA.

The postage rate applicable in the United States to "second-class matter" addressed for delivery in Canada is 1 cent for each 4 ounces or fraction of 4 ounces, calculated on the weight of each package and prepaid by means of postage stamps affixed; except that the postage rate to publishers and news agents applicable to legitimate daily newspapers issued as frequently as six times a week addressed to bona fide subscribers in Canada, is 1 cent a

For printed matter of all kinds, 1 cent for office of mailing as second-class matter.

RATES OF POSTAGE ON ARTICLES FOR FOREIGN COUNTRIES OTHER THAN ABOVE.

Articles for or from foreign countries (except Canada,* Cuba, Mexico and the Republic of Panama and the United States Postal Agency at Shanghai, as indicated above, are not designated "First-class matter," "Second-class matter," etc.; but are classified as "Letters," "Post cards," "Printed matter," "Commercial papers" and "Samples of merchandise," and are subject to the postage rates indicated below:

For letters, 5 cents for the first ounce, or fraction of an ounce, and 3 cents for each additional ounce, or fraction of an ounce. Stamps or forms of prepayment, whether current or obsolete, canceled or uncanceled, as well as printed articles constituting the representative sign of monetary value, and articles in typewriting or imitation of typewriting, are subject to postage at the letter rate. Monetary value is held by the International Bureau of the Universal Postal Union to attach to bonds, bank notes, commercial bills of exchange, etc., which have been fully executed by the makers:

For postal cards, 2 cents each, for single, and 4 cents each for double cards.

each 2 ounces or fraction of 2 ounces.

For commercial papers, 5 cents for the first 10 ounces or less, and 1 cent for each additional 2 ounces or fraction of 2 ounces.

For samples, 2 cents for the first 4 ounces or less, and 1 cent for each additional 2 ounces or fraction of 2 ounces.

Registration fee, in addition to postage, 10 cents.

Letters for England, Ireland, Scotland, Wales and Newfoundland, 2 cents per ounce, and letters for Germany dispatched only by steamers which land the mails at German ports, 2 cents per ounce.

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*Newfoundland is not included in the Dominion of Canada.

DOMESTIC PARCEL POST.

The provisions of the act approved August 24, 1912, authorizing the establishment of the Parcels Post System embodying a zone system of postal rates according to certain prescribed distances from a given territorial center to take effect Jan. 1, 1913, provides that fourth-class mail matter is to embrace all other matter, including farm and factory products, not now embraced by law in either the first, second, or third-class, not (exceeding twenty pounds in weight when mailed for delivery within the first and second zones, nor) exceeding eleven pounds in weight (when for delivery in any of the other zones), nor greater in size than 72 inches in length and girth combined, nor in form or kind likely to injure the person of any postal employee or damage the mail equipment or other mail matter and not of a character perishable within a period reasonably required for transportation and delivery.

For parcels post purposes the United States and its several Territories and possessions, excepting the Philippine Islands, are divided into units of area thirty minutes square, identical with a quarter of the area formed by the intersecting parallels of latitude and meridians of longitude.

There is a flat rate of one cent per ounce up to four ounces regardless of distance. Above four ounces, rates are by the pound or fraction thereof, and varying with the distance as given in the adjoining table and table on page 342.

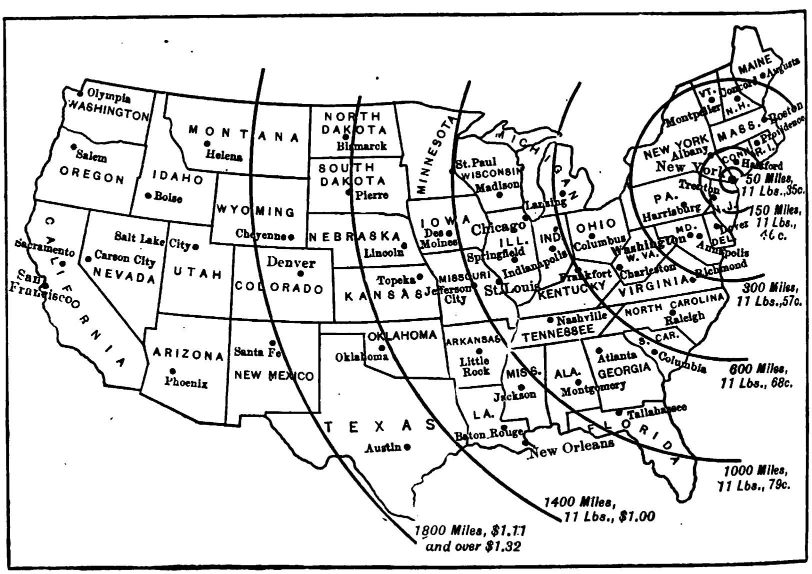
INSURED AND C. O. D. PARCELS—FEES CHARGED AND INDEMNITY PROVIDED—RETURN RECEIPTS

A mailable parcel on which the postage is fully prepaid may be insured against loss in an amount equivalent to its actual value, but not to exceed $25, on payment of a fee of five cents, and in an amount equivalent to its actual value in excess of $25, but not to exceed $50, on payment of a fee of ten cents in stamps, such stamps to be affixed.

	First Pound.	Each Addit. Pound.	Eleven Pounds.
300-mile zone	.07	.05	.57
600-mile zone	.08	.06	.68
1,000-mile zone	.09	.07	.79
1,400-mile zone	.10	.09	1.00
1,800-mile zone	.11	.10	1.11
Over 1,800 miles......	.12	.12	1.32

The sender of a mailable parcel on which the postage is fully prepaid may have the price of the article and the charges thereon collected from the addressee on payment of a fee of ten cents in stamps affixed, provided the amount to be collected does not exceed $100. Such a parcel will be insured against

Continued on page 342.



RATE ZONES FOR DOMESTIC PARCELS POST.

APPROXIMATE TIME OF MAILS, AND DISTANCES BETWEEN NEW YORK AND CERTAIN PLACES IN FOREIGN COUNTRIES.

Name of place.	via	Days.	Statute miles.
Accra (Africa)	London	24	8,075
Addah (Africa)	London	36	8,130
Adelaide (South Australia)	London	38	15,315
Adelaide (South Australia)	Vancouver	31	12,845
Aden (Arabia)	London	17	7,875
Akyab (British Burmah)	London	33	11,670
Alexandria (Egypt)	London	12	6,150
Algiers (Africa)	London	9	5,030
Ambriz (Africa)	London	35	9,785
Amsterdam (Netherlands)	London	8	3,985
Antigua (Leeward Islands)		8	1,790
Antwerp (Belgium)	London	8	4,000
Arica (Peru)	Panama	20	4,835
Aspinwall, see "Colon"		..	......
Athens (Greece)	London	11	5,655
Auckland (New Zealand)	San Francisco	28	10,120
Bahia (Brazil)		14	5,870
Basle (Switzerland)	London	9	4,420
Bangkok (Siam)	London	41	13,125
Bangkok (Siam)	San Francisco	43	12,900
Barbados (West Indies)		6–8	2,145
Barcelona (Spain)	London	9	4,790
Batavia (Java)	London	34	12,800
Bathurst (Africa)	London	22	6,705
Bayonne (France)	London	10	4,510
Belize (British Honduras)	New Orleans	9	2,360
Berlin (Germany)	London	8	4,385
Berne (Switzerland)	London	9	4,490
Beirut (Syria)	London	15	6,475
Bombay (British India)	London	22	9,765
Bonny (Africa)	London	42	8,590
Bordeaux (France)	London	8	4,385
Bremen (Germany)	London	7–8	4,235
Brindisi (Italy)	London	10	5,205
Brisbane (Queensland, Australia)	Vancouver	28	12,190
Brussels (Belgium)	London	7–8	3,975
Budapest (Hungary)	London	9	4,910
Buenos Ayres (Argentine Republic)		24	8,045
Bunder Abbas (Persian Gulf)	London	34	9,500
Bushire (Persian Gulf)	London	30	9,950
Busreh (Persian Gulf)	London	38	10,160
Cadiz (Spain)	London	10	5,375
Cairo (Egypt)	London	12	6,280
Calcutta (British India)	London	24	11,120
Caldera (Chile)	Panama	31	5,455
Callao (Peru)	Panama	15	4,145
Cameroons (Africa)	London	31	8,805
Cape Coast Castle (Africa)	London	24	8,810
Cape Haitien (Haiti)		6	1,466
Cape Palmas (Africa)	London	33	7,570
Cape Town (South Africa)	London	25	11,245
Carril (Spain)	London	12	5,545
Carthagena (Colombia)	Panama	9	2,445
Cherbourg (France)		6–8	3,780
Christiania (Norway)	London	9	4,650
Cienfuegos	Havana	5	......
Ciudad Bolivar (Venezuela)		11	2,715
Cobija (Bolivia)	Panama	37	5,135
Cologne (Germany)	London	8	4,115
Colon (Panama)		6–7	2,281
Congo (Africa)	London	28	9,605
Constantinople (Turkey)	London	11	5,810
Copenhagen (Denmark)	London	8–10	4,575
Coquimbo (Chile)	Panama	21	5,685
Crete (Turkey)	London	16	5,835
Curacao (West Indies)		8	2,030
Cyprus (British)	London	14	6,345
Delagoa Bay (Africa)	London	30	11,520
Demerara (British Guiana)		11	2,605
Dominica (Leeward Islands)		12	1,920
Dresden (Germany)	London	9	4,555
Falkland Islands		33	9,120
Faroe Islands	London	14	4,740
Fernando Po (Africa)	London	45	8,745
Fiji Islands	Vancouver	24	8,855
Florence (Italy)	London	9	4,800
Frankfort-on-Main (Germany)	London	8–9	4,250
Gaboon (Africa)	London	47	9,055
Geneva (Switzerland)	London	8–9	4,410
Genoa (Italy)	London	9	4,615
Gibraltar	London	11	5,150
Glasgow (Scotland)	London	8	3,370
Gothenburg (Sweden)	London	9	4,755
Goree (Africa)	London	23	6,600
Granada (Spain)	London	13	5,355
Grand Bassam (Africa)	London	33	7,395
Grand Canary Island	London	13	5,695
Grenada (Windward Islands)		9	2,325
Greytown (Nicaragua)	New Orleans	7	2,815
Guadeloupe (West Indies)		11	1,865
Guatemala City (Guatemala)	New Orleans	7	2,645
Guayaquil (Ecuador)	Panama	14	3,295
Guaymas (Mexico)	R. R.	6	3,025
Hague (The Netherlands)	London	9	3,950
Half Jack (Africa)	London	31	7,670
Halifax (Nova Scotia)		2	645
Hamburg (Germany)	Direct	9	4,820
Hamburg (Germany)	London	9	4,340
Hamilton (Bermuda)		2	780
Havana (Cuba)		3	1,366
Havre (France)		8	3,940
Hong-Kong (China)		27	10,590
Honolulu (Hawaii)	San Francisco	12	5,645
Iceland	London	15	5,350
Inhambane (Africa)	London	44	11,240
Interlaken (Switzerland)	London	9	4,525
Iquique (Chile)	Panama	18	4,965
Isles do Los (Africa)	London	25	7,050
Jacmel (Haiti)		7	1,910
Jeddah (Arabia)	London	21	7,090
Kingston (Jamaica)		5	1,820
Kurrachee (British India)	London	23	10,330
Lagos (Africa)	London	25	8,310
La Guayra (Venezuela)		8–10	2,258
Lisbon (Portugal)	London	10	5,335
Little Popo (Africa)	London	38	8,185
Liverpool (England)		7	3,540
Livingston (Guatemala)	New Orleans	10	2,495
Loanda (Africa)	London	28	9,855
London (England)	Plymouth	7	3,740
London (England)	Fishguard	6	3,760
Lucerne (Switzerland)	London	9	4,480
Lyons (France)	London	9	4,340
Maceio (Brazil)		17	5,555
Madeira Island	London	12	5,345
Madras (British India)	London	24	10,525
Madrid (Spain)	London	9	4,925
Magdalena Bay (Mexico)	San Francisco	10	4,375
Malaga (Spain)	London	11	5,320
Malta Island	London	12	5,280
Maracaibo (Venezuela)		11	2,280
Maranham (Brazil)		16	3,805
Marseilles (France)	London	9	4,560
Martinique (West Indies)		9	1,980
Mauritius Island	London	35	12,350
Mayaguez (Porto Rico)		7	1,830
Mazatlan (Mexico)	San Francisco	10	4,795
Melbourne (Victoria, Australia)	Vancouver	30	12,265
Mexico City (Mexico)	R. R.	5	3,750
Milan (Italy)	London	9	4,615
Mollendo (Peru)	Panama	20	4,655
Monrovia (Liberia, Africa)	London	28	7,335
Montevideo (Uruguay)		23	7,165
Moscow (Russia)	London	11	5,535
Moulmein (British Burmah)	London	36	12,020
Mozambique (Africa)	London and Brindisi	33	10,470
Munich (Bavaria)	London	9	4,610
Muscat (Muscat)	London	35	9,230
Naples (Italy)	London	9	5,195
Nassau (Bahamas)		3	1,105
Natal (Africa)	London	30	12,062
Nice (France)	London	9	4,700
Nuremberg (Bavaria)	London	9	4,395
Odessa (Russia)	London	10	5,455

APPROXIMATE TIME AND DISTANCE — Continued.

Name of place.	via	Days.	Statute miles.
Old Calabar (Africa)	London	38	8,675
Oporto (Portugal)	London	9	5,405
Pago Pago, (Samaon Islands)	San Francisco	14	4,160
Panama (Panama)	Colon	6	2,355
Papeete (Tahiti)	San Francisco	17	4,212
Para (Brazil)		12	3,460
Paris (France)		8	4,020
Payta (Peru)	Panama	15	3,545
Penang (Straits Settlements)	London	38	11,733
Pernambuco (Brazil)		16	5,425
Perth (West Australia)		34	14,415
Point de Galle (Ceylon)	London	29	10,405
Port au Prince (Haiti)		7	1,600
Port Limon (Costa Rica)	New Orleans	6	2,865
Puerto Cabello (Venezuela)		10	2,160
Puerto Plata (San Domingo)		7	1,570
Quebec (Canada)		2	555
Queenstown (Ireland)		6	3,250
Quilimane (Africa)	London	38	10,840
Quitta (Africa)	London	27	8,150
Rangoon (British India)	London	26	11,900
Riga (Russia)	London	11	5,190
Rio de Janeiro (Brazil)		17	6,204
Rome (Italy)	London	9	5,030
Rotterdam (Netherlands)	London	8	3,935
Saigon (Cochin China)	London	36	12,920
Saigon (Cochin China)	San Francisco	38	12,240
St. Helena Island	London	25	9,280
St. John's (Newfoundland)		5	1,245
St. Kitts (Leeward Islands)		8	1,800
St. Lucia (Windward Islands)		9	2,025
St. Petersburg (Russia)	London	9–10	5,370
St. Thomas (West Indies)		6	1,650
St. Vincent (Cape de Verde Islands)	London	18	6,625
St. Vincent (Windward Islands)		11	2,245
Salt Pond (Africa)	London	34	8,050
Samana (San Domingo)		8	1,700
San Domingo City (San Domingo)		9	1,920
San Juan (Porto Rico)		6	1,730
Santa Marta (Colombia)	Panama	13	2,310
Santander (Spain)	London	10	4,875
Santiago (Chile)	Panama	23	6,010
Santos (Brazil)		19	6,980
Savanilla (Colombia)		9	2,380
Senegal (Africa)	London	27	6,505
Seychelles Islands (Indian Ocean)	London	37	9,485
Shanghai (China)	Berlin	22	14,745
Shanghai (China)	Vancouver	25	9,920
Sierra Leone (Africa)	London	20	7,125
Singapore (Straits Settlements)	London	30	12,175
Singapore (Straits Settlements)	San Francisco	38	12,240
Southampton (England)		7	3,680
Stockholm (Sweden)	London	10	4,975
Strassburg (Germany)	London	9	4,335
Stuttgart (Germany)	London	10	4,460
Suez (Egypt)	London	14	6,370
Sydney (New South Wales)	Vancouver	29	11,570
Tampico (Mexico)	New Orleans	7	2,250
Teneriffe (Canary Islands)	London	14	5,645
Tiflis (Caucasus)	London	18	6,630
Tours (France)	London	10	4,165
Trieste (Austria)	London	10	4,910
Trinidad (West Indies)		8	2,370
Turin (Italy)	London	9	4,520
Turk's Island (Bahamas)		5	1,320
Valparaiso (Chile)	Panama	22	5,915
Venice (Italy)	London	9	4,780
Vera Cruz (Mexico)	R. R.	6	4,010
Vera Cruz (Mexico)	Steamer	8	2,500
Vienna (Austria)	London	9	4,740
Vigo (Spain)	London	12	5,500
Wellington (New Zealand)	San Francisco	27	10,490
Whydah (Africa)	London	39	8,225
Winnebah (Africa)	London	34	8,055
Yarmouth (Nova Scotia)		1	518
Yokohama (Japan)		20	7,345
Zanzibar (Africa)	London	30	9,820
Zurich (Switzerland)	London	9	4,175

DOMESTIC PARCELS POST—Continued from Page 340.

loss, without additional charge, in an amount equivalent to its actual value, but not to exceed $50.

A C. O. D. parcel will be accepted for mailing only at a money-order office and when addressed to a money-order office.

A parcel may be forwarded without the payment of an additional C. O. D. fee.

Return receipts, signed upon delivery, will be obtained for the sender of an insured parcel if the wrapper is plainly endorsed on the address side "Return receipt desired." No return receipt will be furnished the sender of a C. O. D. parcel, as the money order issued in his favor at the office of delivery serves that purpose.

The pound rates of postage in the first and second zones shall be as follows:

Weight.	First zone.		Second-zone rate.	Weight.	First zone.		Second-zone rate.
	Local rate.	Zone rate.			Local rate.	Zone rate.	
1 pound	$0.05	$0.05	$0.05	11 pounds	$0.10	$0.15	$0.15
2 pounds	.06	.06	.06	12 pounds	.11	.16	.16
3 pounds	.06	.07	.07	13 pounds	.11	.17	.17
4 pounds	.07	.08	.08	14 pounds	.12	.18	.18
5 pounds	.07	.09	.09	15 pounds	.12	.19	.19
6 pounds	.08	.10	.10	16 pounds	.13	.20	.20
7 pounds	.08	.11	.11	17 pounds	.13	.21	.21
8 pounds	.09	.12	.12	18 pounds	.14	.22	.22
9 pounds	.09	.13	.13	19 pounds	.14	.23	.23
10 pounds	.10	.14	.14	20 pounds	.15	.24	.24

NOTE.—The rate for local delivery shall apply to all parcels mailed at a post office from which a rural route starts, for delivery on such route, or mailed at any point on such route for delivery at any other point thereon, or at the office from which the route starts, or on any rural route starting therefrom, and on all matter mailed at a city carrier office, or at any point within its delivery limits, for delivery by carriers from that office, or at any office for local delivery.

INTERNATIONAL PARCEL POST.

COUNTRIES TO WHICH PARCELS MAY BE SENT; MAXIMUM DIMENSIONS, WEIGHT, VALUE AND RATES OF POSTAGE APPLICABLE TO PARCELS; AND EXCHANGE POST OFFICES WHICH DISPATCH AND RECEIVE PARCEL POST MAILS.

Parcel-post packages may also be mailed in Hawaii, Porto Rico, The Philippines, Guam, Tutuila and the Canal Zone, to the following countries and colonies with which the United States have parcel-post conventions, subject to the rules and regulations as are herein prescribed.

Names of countries.	Allowable dimensions and weight of parcels.				Postage rate.	Limit of value.	Exchange post offices.	
	Greatest length.	Greatest length and girth combined.	Greatest girth.	Greatest weight.			United States.	Foreign.
	Ft.	Ft.	Ft.	Lbs.				
Australia	3½	6	....	11	12 cents a pound or fraction of a pound to all countries.	None.	San Francisco; Honolulu	Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Launceston.
Austria, including the Austrian offices in the Ottoman Empire at Alexandretta, Beyrout, Caifa Candia Canea, Cavalla, Chios, Dardanelles, Dedeagh, Durazzo, Ineboli Jaffa, Janina, Jerusalem, Kerassonda, Mersina, Mytilene, Prevesa, Retimo, Rhodes, Salonica, Samsoun, San Giovanni di Medua, Santi Quaranta, Scutari d'Albanie, Smyrna, Trebisond, Tripoli (Syria), Valona, Vathi (Samos).	3½	6	....	11		None.	New York; Chicago	Triest.
Bahamas	3½	6	....	11		None.	......do	Nassau.
*Barbados	3½	6	....	11		None.	......do	Bridgetown.
Belgium	3½	6	....	11		None.	......do	Antwerp.
Bermuda	3½	6	....	11		None	......do	Hamilton.
Bolivia	3½	6	....	11		None.	New York and San Francisco.	La Paz.
Brazil	3½	6	....	11		None.	New York	Bahia, Para, Pernambuco, Rio de Janairo and Sao Paulo.
British Guiana	3½	6	....	11		None.	All offices authorized to exchange mails between the two countries.	
Chile	3½	6	....	11		None.	New York, San Francisco	Valparaiso.
Colombia	2	......	4	11		None.	All offices authorized to exchange mails between the two countries.	
Costa Rica	3½	6	....	11		None.	Do.	
*Curacao (including Aruba, Bonaire, Saba, St. Eustatms and the Dutch part of St. Martins).	3½	6	....	11		None.	New York	Wilhemstad.
Danish West Indies (St. Croix, St. John and St. Thomas).	3½	6	....	11		None.	Do.	
Denmark (including Faroe Islands and Iceland).	3½	6	....	11		None.	New York; Boston; Chicago	Copenhagen.
Dominican Republic	3½	6	....	11		None.	New York	Santo Domingo.
Ecuador	3½	6	....	11		$50	New York; New Orleans; San Francisco	Guayaquil.
*Dutch Guiana	3½	6	....	11		None.	New York	Paramaribo.
*France (excluding Algeria and Corsica)	3½	6	....	11		None.	New York	Cherbourg and Havre.
Germany (including Cameroon, Togo, German East Africa, German South-west Africa, Protectorate of Kiowchow and certain German post offices in China).	3½	6	....	11		None.	New York; Chicago; Boston; St. Louis; Philadelphia; Baltimore	Hamburg. Bremen.
*Great Britain, including Ireland	3½	6	....	11		None.	New York; Chicago; Boston; Philadelphia; St. Louis; Baltimore; San Francisco	London. Liverpool. Dublin.
Guatemala	3½	6	....	11		None.	New York; New Orleans; San Francisco	Guatemala City. Retalhuleu and Puerto Barrios.
Guadeloupe (including Marie Galante, Desead, Les Saints, St. Bartholomew and the French portion of St. Martins.)	3½	6	....	11		None.	New York; San Juan, P. R.	Basse-Terre.
Haiti	3½	6	....	11		None.	New York	Port au Prince.
Honduras (British)	3½	6	....	11		None.	New Orleans	Belize.
Honduras (Republic of)	3½	6	....	11		None.	New York; New Orleans; San Francisco	Tegucigalpa. Puerto Cortez. Amapala. Trujillo.

* Parcels cannot be registered.

COUNTRIES TO WHICH PARCELS MAY BE SENT; MAXIMUM DIMENSIONS, WEIGHT, VALUE AND RATES OF POSTAGE APPLICABLE TO PARCELS; AND EXCHANGE POST OFFICES WHICH DISPATCH AND RECEIVE PARCEL POST MAILS—Continued.

Names of countries.	Allowable dimensions and weight of parcels. Greatest length.	Greatest length and girth combined.	Greatest girth.	Greatest weight.	Postage rate.	Limit of value.	Exchange post offices. United States.	Foreign.
	Ft.	Ft.	Ft.	Lbs.				
Hong-Kong. See section 107 below...	3½	6	....	11	12 cents a pound or fraction of a pound to all countries.	None.	San Francisco; Seattle; Tacoma; Honolulu	Hong-Kong.
Hungary	3½	6	....	11		None.	New York; Chicago	Fiume.
Italy, (including Rep. of San Marino, Italian Colonies of Benadir and Erythrea, and the Italian offices in the Ottoman Empire at Bengazi (North Africa), Durazzo (Albania), Galata (Constantinople), Jerusalem (Palestine), Canea (Crete), Pera (Constantinople), Salonica (Roumelia), Scutari (Asia Minor), Smyrna (Asia Minor), Stamboul (Constantinople), Tripoli-in-Barbary, Valona (Albania).	3½	6	....	11		None.	Philadelphia; Chicago; New York; Boston	Naples.
Jamaica, including the Turks and Caicos Islands.	3½	6	....	11		None.	Boston; Philadelphia; Baltimore	Port Antonio.
Japan, including Formosa, Karafuto (Japanese Saghalien) and Korea. See section 107 below.	3½	6	.....	11		None.	San Francisco; Seattle; Tacoma; Honolulu	Yokohama. Kobe. Nagasaki.
Leeward Islands (Antigua with Barbuda and Redonda, St. Kitts, Nevis with Anguilla, Dominica, Montserrat and the Virgin Islands).	3½	6	....	11		None.	New York	St. John. Antigua.
Mexico	2	......	4	†		None.	All offices authorized to exchange mails between the two countries.	
Martinique	3½	6	....	11		None.	New York; San Juan, P. R.	Fort-de-France.
*Netherlands	3½	6	....	11		None.	New York	Rotterdam.
Newfoundland	3½	6	....	11		None.	New York; Boston; Philadelphia	St. John's.
New Zealand, including Fanning Island	3½	6	....	11		None.	San Francisco; Honolulu	Auckland.
Nicaragua	3½	6	....	11		None.	New York; New Orleans; San Francisco	Bluefields. San Juan del Norte. Corinto.
Norway	3½	6	....	11		None.	New York; Boston; Chicago	Christiania.
Panama (See section 2)	3½	6	....	11		None.	New York; New Orleans; San Francisco	Colon, Bocas del Toro.
Peru	3½	6	....	11		None.	New York; New Orleans; San Francisco	Lima.
Salvador	3½	6	....	11		None	New York; San Francisco	San Salvador.
Sweden	3½	6	....	11		None.	New York; Boston; Chicago	Malmo.
Trinidad, including Tobago	3½	6	....	11		None.	New York	Port of Spain.
*Uruguay	3½	6	....	11		None.	New York	Montevideo.
Venezuela	3½	6	....	11		None.	All offices authorized to exchange mails between the two countries.	
Windward Islands (Grenada, St. Vincent, the Grenadines and St. Lucia).	3½	6	....	11		None.	do.	

POST OFFICE DEPARTMENT.

The Postmaster General is the executive head of the Federal postal service. He appoints all officers and employees of the Post Office Department except the four Assistant Postmasters General and the Purchasing Agent, who are Presidential appointees. With the exception of postmasters of the first, second, and third classes, who are likewise Presidential appointees, he appoints all postmasters and all other officers and employees of the service at large. Subject to the approval of the President, he makes postal treaties with foreign governments. He awards and executes contracts and directs the management of the foreign mail service.

INTERNATIONAL PARCELS POST.

Parcel Post Conventions with Argentine Republic, Cuba, Portugal, Russia, Spain and the French Colony of St. Pierre and Miquelon are pending, with prospect of an early and successful conclusion of the negotiations.

A very important modification of the service was reached by agreement with the Treasury Department to the effect that the value limit for the contents of parcels might be eliminated. Negotiations were at once underaken, with the result that there is now no value limit, except as regards Ecuador.

We now have conventions with forty-eight foreign countries. The following are the essential characteristics of the service:

Postage rate, uniform at 12 cents per pound.

Limit of weight, uniform at 11 pounds.

Limit of value, uniformly none, with the single exception of Ecuador, $50.

Limit of size, uniform at 3 feet 6 inches greatest length; 6 feet greatest combined length and girth, except to Mexico and Columbia—2 feet greatest length and 4 feet greatest girth.

The weight of the parcel post mails dispatched from the United States during the year was 2,270,215 pounds, an increase of 445,592 pounds, or 24.4 per cent. The number of parcels dispatched was 718,828, of an average weight of 3.15 pounds, an increase in number of 103,568, or 16.8 per cent. The weight of the parcel post mails received was 1,967,779 pounds, an increase of 287,055 pounds, or 17 per cent. The number of parcels received was 406,456, of an average weight of 4.84 pounds, an increase in number of 47,237, or 13.1 per cent.

The fact that the percentages of increase in the number of parcels and in total weights are greater as regards the parcels sent than as regards those received from abroad is again gratifying, and indicates the steady and continuous growth of the service as an advantageous means of increasing the country's exports.

INFORMATION FOR SHIPPERS.

Admissible Articles.—Any article absolutely prohibited admission to the regular mails for any country is also inadmissible to Parcel Post mails for that country; except that no article is excluded from Parcel Post mails solely because it is dutiable in the country of destination.

How to Mail Parcels.—A parcel must not be posted in a letter-box, but must be handed to the postmaster or other official in charge of the post office.

Address, etc.—Every parcel must bear a complete and legible address, not written in pencil, and marked conspicuously "Parcel Post."

Packing.—Every parcel must be securely and substantially packed; but in such a way that it can be opened without damaging its cover, in order that its contents may be easily examined by postmasters and customs officials.

Postage.—Postage on every parcel must be fully prepaid at the rate applicable thereto as indicated in the tables on pages 343-344.

Letters Must Not Accompany Parcels.—A communication of the nature of personal correspondence must not accompany or be written on any parcel (but an open bill or invoice may be included). If such written matter be found it will be placed in the mails if separable, and if inseparable the entire parcel must be rejected.

Separately Addressed Packages.—Parcels must not contain packages addressed to persons other than the person named on the outside address of the parcel itself. If such enclosed packages be detected they must be sent forward singly charged with new and distinct parcel post rates.

No Responsibility for Loss.—The Department is not responsible for the loss of or damage to any parcel.

Registration.—The sender of a parcel addressed to any of the places indicated in the foregoing table, except Barbados, Dutch Guiana, France, Great Britain, Guadeloupe, Martinique, The Netherlands and Uruguay may have the parcel registered by paying a registration fee of 10 cents, and will receive the "return receipt" without additional charge therefor, provided he demands a return receipt when he mails the parcel.

Undeliverable Parcels Returned to United States.—An undeliverable parcel returned to the United States, upon which the return postage has not been prepaid, is subject on delivery to the sender to a postage charge equal to the amount of postage originally prepaid on the parcel; which amount should be marked on the parcel by the United States exchange post office which receives it back from abroad, and collected by the post office which delivers it to the sender.

Customs Declarations.—A "customs declaration" properly filled out must be securely attached to every parcel. The contents must be accurately described. General terms such as "merchandise" and "samples" will not answer.

Customs Duties.—Customs duties cannot be prepaid; they will be collected of addressees when the parcels are delivered.

POSTAL SAVINGS SYSTEM.

The Third Assistant Postmaster General, as the official of the Post Office Department charged with the general supervision of the financial operations of the postal service, supervises the conduct of postal savings business at post offices. As the representative of the Board of Trustees of the Postal Savings System, he transacts all business involving securities and the investment of funds. He conducts all correspondence of the Postal Savings System and examines the accounts of postmasters, banks and other financial agents receiving and disbursing funds.

RATES OF POSTAGE IN CERTAIN FOREIGN COUNTRIES ON ARTICLES SENT TO THE UNITED STATES.

[5 centimes, French currency, are the equivalent of 1 cent, United States money.]

Countries.	Letter rate for the first weight-unit.		For each additional unit.	Single postal cards, each.*		Other articles, per 50 grams, equal to 2 oz.		Charge for registration.	Charge for return-receipt.
	Currency of country.	Centimes.	Currency of country.	Currency of country.	Centimes.	Currency of country.	Centimes.		
Antigua	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Argentine Republic	12 centavos	25	12 centavos (2)	5 centavos	10	3 centavos	5	12 centavos	12 centavos.
Ascension	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Australia	do	25	2½ pence (3)	1 penny	10	1 penny	10	3 pence	Do.
Austria	25 heller	25	15 heller. (2)	10 heller	10	5 heller	5	25 heller	25 heller.
Bahamas	1 penny	10	1 penny (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Barbados	2½ pence	25	1½ pence (1)	do	10	do	5	do	Do.
Bechuanaland Protectorate	do	25	2½ pence (3)	do	10	do	5	4 pence	Do.
Belgium	25 centimes	....	15 centimes (2)	10 centimes	....	5 centimes	....	25 centimes	25 centimes.
Bermuda	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Bolivia, via Panama	22 centavos	55	14 centavos (2)	8 centavos	20	6 centavos	15	} 10 centavos	10 centavos.
Bolivia, via San Francisco	20 centavos	50	12 centavos (2)	6 centavos	15	4 centavos	10		
Bosnia-Herzegovina	25 heller	25	15 heller (2)	10 heller	10	5 heller	5	25 heller	25 heller.
Brazil	200 reis	30	200 reis (3)	100 reis	12½	50 reis*¶	6½	400 reis	200 reis.
Bulgaria	25 stotinki	25	15 stotinki (2)	10 stotinki	10	5 stotinki	5	25 stotinki	25 stotinki.
Canada	2 cents per oz	10	....	1 cent	5	Canadian domestic rates.	....	5 cents	5 cents.
Cayman Islands	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Cape Colony†	do	25	2½ pence (3)	do	10	½ penny	5	4 pence	Do.
Ceylon	15 cts. of rupee	25	9 centimes (1)	6 cts. of rupee	10	3 cts. of rupee	5	10 cts. of rupee	10 cts. of rupee.
Chile	20 centavos	25	10 centavos (2)	8 centavos	10	4 centavos	5	20 centavos	20 centavos.
China, Empire of, also foreign offices in.	10 cents	25	6 cents (2)	4 cents	....	2 cents	....	10 cents	10 cents.
Colombia, Republic of	5 gold centavos	25	5 centavos (3)	2 gold centavos	10	1 gold centavo	5	10 gold centavos	5 gold centavos.
Congo, Independent State of	25 centimes	....	25 centimes (3)	10 centimes	10	5 centimes	5	25 centimes	10 centimes.
Costa Rica	10 centimos	25	10 centimos (3)	4 centimos	10	2 centimos	5	10 centimos	5 centimos.
Crete	25 lepta, 20 gms.	25	15 lepta, 15 gms.	10 lepta	10	5 lepta	5	25 lepta	20 lepta.
Cuba‡	2 centavos (1)	10	2 centavos (1)	1 centavo	5	1 centavo	5	8 centavos	
Cyprus	2 piastres	25	1½ piastres (1)	1 piastre	10	½ piastre	5	2 piastres	2 piastres.
Danish West Indies	25 bit	25	15 bit (2)	10 bit	10	5 bit	5	25 bit	15 bit.
Denmark	20 ore	25	10 ore (2)	10 ore	10	5 ore	5	15 ore	10 ore.
Dominican Republic (direct)	5 centavos	25	5 centavos (3)	2 centavos	10	2 centavos	5	5 centavos	5 centavos.
Dominica	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
East Africa, British	15 cents	25	9 cents (1)	6 cents	10	3 cents	5	12 cents	12 cents.
Ecuador	10 centavos	50	10 centavos (3)	3 centavos	15	1 centavo	5	10 centavos	5 centavos.
Egypt	10 milliemes	25	6 milliemes (2)	4 milliemes de livre	10	2 milliemes de livre	5	10 milliemes de livre	10 milliemes de livre.
Ethiopia	2 guerches	25	1 guerche (2)	½ guerche	10	½ guerche	5	2 guerches	½ guerche
Falkland Islands	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Fiji Islands	do	25	do	do	10	do	5	3 pence	Do.
France and Colonies	25 centimes	....	15 centimes (2)	10 centimes	....	5 centimes	....	25 centimes	10 centimes.
Gambia	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.

Germany**	20 pfennig	....	10 pfennig (2)	10 pfennig	10	5 pfennig	5	20 pfennig	20 pfennig.
German Protectorates, viz.:								
Cameroons (or Kameron) Togo. German South West Africa, in *Africa*. Caroline and Palaos Islands, Mariana Islands, Marshall Islands, New Guinea and Samoa, in the Pacific	...do	25	.....do	.....do	10	.....do	5	.....do	do.
Gilbert and Ellice Islands	2½ pence	25	2½ pence (8)	1½ pence	15	1½ penny §§	15	3 pence	2½ pence.
Kiautschau, in China	10 cents (Mex.)	25	6 cents (2)	4 cents (Mex.)	10	2 cents (Mex.)	5	10 cents (Mex.)	10 cents (Mex.).
German East Africa	15 heller	25	7½ heller (2)	7½ heller	10	4 heller	5	15 heller	15 heller.
Gibraltar	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Gold Coast	.....do	25	.....do	.....do	10	.....do	5	.....do	do.
Great Britain	1 penny	10	1 penny (1)	.....do	10	.....do	5	.....do	do.
Greece	25 lepta	25	25 lepta (3)	10 lepta	10	5 lepta	5	25 lepta	20 lepta.
Greenland	20 ore	25	10 ore (2)	10 ore	10	5 ore	5	15 ore	10 ore.
Grenada	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Guam, Island of§	....	....	....	....	....	....	....	....	....
Guatemala	50 centavos	50	50 centavos (3)	15 centavos	15	10 centavos	10	50 centavos	25 centavos.
Guiana, British	5 cents	25	3 cents (1)	2 cents	10	1 cent	5	4 cents	4 cents.
Guiana, Dutch	12½ cents Dutch	25	7½ cents (2)	5 cents Dutch	10	2½ cents Dutch	5	10 cents Dutch	10 cents Dutch.
Hawaii§	....	....	....	....	....	....	....	....	....
Haiti	5 centavos	25	5 centavos (3)	2 centavos	10	1 centavo	5	5 centavos	8 centavos.
Honduras, Republic of	15 centavos	37½	11 centavos (2)	5 centavos	12½	3 centavos	7½	10 centavos	5 centavos.
Honduras, British	5 cents	25	3 cents (1)	2 cents	10	1 cent	5	5 cents	5 cents.
Hong-Kong	10 cents	25	6 cents (1)	4 cents	10	2 cents	5	10 cents	10 cents.
Hungary	25 filler	25	15 filler (2)	10 filler	10	5 filler	5	25 filler	25 filler.
India, British	2½ annas	25	1½ annas (1)	1 anna	10	½ anna or 6 pies.	5	2 annas	1 anna.
Italy and Colony of Eritrea	25 centesimi	25	25 centesimi (3)	10 centesimi	10	5 centesimi	5	25 centesimi	25 centesimi.
Italian Protectorate of Benadir	2½ annas	25	2½ annas (3)	1 anna	10	2 besas	5	2½ annas	2½ annas.
Jamaica	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2 pence.
Japan	10 sen	25	6 sen (2)	4 sen	10	2 sen	5	10 sen	5 sen.
Korea	....do	25	.....do (2)	.....do	10	.....do	5	.....do	do.
Labaun	8 cents	25	5 cents (1)	3 cents	10	1 cent	5	10 cents	8 cents.
Lagos	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Liberia	5 cents	25	5 cents (3)	3 cents	15	1 cent	5	10 cents	5 cents.
Luxemburg	25 centimes	....	15 centimes (2)	10 centimes	....	5 centimes	....	25 centimes	25 centimes.
Malta	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Mauritius	15 cts. of rupee	25	9 cts. (1)	6 cts. of rupec	10	3 cts. of rupee	5	12 cts. of rupee	15 cts. of rupee.
Mexico	5 centavos	12½	5 centavos (2)	2 centavos	10	1 centavo	5	10 centavos	5 centavos.
Montenegro	25 paras	25	25 paras (3)	10 paras	10	5 paras	5	25 paras	25 paras.
Montserrat	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Mozambique	50 reis	25	50 reis (3)	20 reis	10	10 reis	5	50 reis	50 reis.
Natal	2½ pence	25	2½ pence (3)	1 penny	10	½ penny	5	4 pence	2½ pence.
Netherlands	12½ cts. Dutch	25	7½ cents (2)	5 cents Dutch	10	2½ cts. Dutch	5	10 cts. Dutch	10 cts. Dutch.

In the countries and colonies marked (1) the weight-unit is one ounce. In countries and colonies marked (2) the weight-unit is twenty grams or about ⅔ ounce. In countries and colonies marked (3) the weight-unit is fifteen grams or about ½ ounce.

* The rate for a reply-paid (double) card is double the rate named in this column.

† Cape Colony comprises, besides the colony proper, Griqualand, Little Namaqualand, St. John's River Territory, Tembuland, Transkei, Walfish Bay, Basutoland, Bechuanaland and Pondoland.

‡ Cuban domestic postage rates and conditions.

§ U. S. domestic postage rates and conditions.

§§ 1 penny for newspapers.

** Letters from Germany by steamers sailing from Germany direct, per each 20 grams, 10 pfennig.

*¶ 80 reis for commercial papers and samples of merchandise.

RATES OF POSTAGE IN CERTAIN FOREIGN COUNTRIES ON ARTICLES SENT TO THE UNITED STATES.—Continued.

[5 centimes, French currency, are the equivalent of 1 cent, United States money.]

Countries.	Letter rate for the first weight-unit.		For each additional unit.	Single postal cards, each.*		Other articles, per 50 grams, equal to 2 oz.		Charge for registration.	Charge for return-receipt.
	Currency of country.	Centimes.	Currency of country.	Currency of country.	Centimes.	Currency of country.	Centimes.		
Netherlands, East Indies	12½ cents Dutch	25	7½ cents (2)	5 cents Dutch	10	2½ cents Dutch	5	10 cents Dutch	10 cents Dutch.
Netherlands, West Indies	do.	25	do.	do.	10	do.	5	do.	do.
Nevis	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Newfoundland	2 cents	10	2 cents (1)	2 cents	10	1 cent	5	5 cents	5 cents.
New Guinea, British	2½ pence	25	2½ pence (3)	1 penny	10	1 penny	10	3 pence	2½ pence.
New Hebrides	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2½ pence	1 penny.
New Zealand, with Cook's Islands	1 penny	10	1 penny (1)	1 penny	10	½ penny	5	do.	2½ pence.
Nicaragua	50 centavos	50	35 centavos (2)	15 centavos	15	10 centavos	10	50 centavos	25 centavos.
Nigeria, Southern	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
North Borneo, British	10 cents	25	10 cents (3)	4 cents	10	2 cents	5	10 cents	6 cents.
North West Rhodesia, British Protectorate	4 pence	40	4 pence (3)	1 penny	10	1 penny	10	4 pence	2½ pence.
Norway	20 ore	25	10 ore (2)	10 ore	10	5 ore	5	20 ore	20 ore.
Nyassaland, British Protectorate	3 pence	30	3 pence (3)	2 pence	20	2 pence	20	4 pence	2 pence.
North East Rhodesia, British Protectorate	2½ do.	25	2½ pence (3)	1 penny	10	do.	20	do.	2½ pence.
See Union of So. Africa	do.		do (3)	do.		½ penny	5	do.	do.
Panama	2½ centesimos (silver)	12½	2 centesimos (2)	1 centesimo	5	1 centesimo	5	5 centesimos	2½ centesimos.
Paraguay	75 centavos	37½	75 centavos (3)	25 centavos	12½	15 centavos	7½	50 centavos	50 centavos.
Persia	13 shahis	25	13 shahis (3)	6 shahis	10	3 shahis	5	13 shahis	13 shahis.
Peru, via San Francisco	10 centavos	25	10 centavos (3)	4 centavos	10	4 centavos	10	10 centavos	10 centavos.
Peru, via Panama	12 centavos	30	12 centavos (3)	do.	10	6 centavos	15		
Philippine Islands†	...	...	...	...	...	...	...	...	...
Porto Rico†	Same as U. S.	...	...	...	...	...	...	...	...
Portugal, including the Azores and Madeira Islands	5 centavos	25	8 centavos	2 centavos	10	1 centavo	5	5 centavos	5 centavos.
Portuguese Colonies: Angola, Cape Verde, Guinea, St. Thome and Princes	50 reis	25	30 reis	20 reis	10	10 reis	5	50 reis	50 reis.
Portuguese India	2 tangas	25	15 reis (2)	10 reis	10	5 reis	5	2 tangas	2 tangas.
Macao	10 avos	25	6 avos (2)	4 avos	10	2 avos	5	10 avos	10 avos.
Timor	do.	25	do. (2)	do.	10	do.	5	do.	do.
Rhodesia, Southern	2½ pence	25	2½ pence	1 penny	10	½ penny	5	4 pence	2½ pence
Roumania	25 bani	25	15 bani (2)	10 bani	10	5 bani	5	25 bani	25 bani
Russia	10 kopecks	25	10 kopecks (3)	4 kopecks	10	2 kopecks	5	10 kopecks	10 kopecks.
Russian postoffices in Turkey	40 paras	25	30 paras (2)	20 paras	...	10 paras	...	40 paras	40 paras
Salvador	17 centavos (2)	35	12 centavos	5 centavos	10	8 centavos	6	20 centavos	5 centavos
Sarawak, British Protectorate of	10 cents	25	6 cents (1)	4 cents	10	2 cents	5	8 cents	10 cents

Servia	25 paras	25	15 paras (2)	10 paras	10	5 paras	5	25 paras	25 paras.
Seychelles	15 cts. of rupee	25	9 centiemes (1)	6 centiemes	10	3 cts. of rupee	5	12 cts. of rupee	15 cts. of rupee.
Siam	14 satangs	25	14 satangs (3)	6 satangs	10	3 satangs	5	14 satangs	14 satangs.
Sierra Leone	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Solomon & Shortland Islands	2½ pence	25	2½ pence (1)	1½ pence	15	1 penny (z)	10	3 pence	2½ pence.
Somaliland, British	2½ annas	25	1½ annas (1)	1 anna	10	½ anna	5	2 annas	2 annas.
Spain	25 centimos	25	15 centimos (2)	10 centimos	10	5 centimos	5	25 centimos	10 centimos.
St. Christopher (St. Kitts)	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
St. Helena	do.	25	do.	do.	10	do.	5	do.	do.
St. Lucia	do.	25	do.	do.	10	do.	5	do.	do.
St. Vincent	do.	25	do.	do.	10	do.	5	do.	do.
Straits Settlements and Labuan	8 cents	25	5 cents (1)	3 cents	10	1 cent	5	10 cents	8 cents.
Sweden	20 ore	25	10 ore (2)	10 ore	10	5 ore	5	15 ore	10 ore.
Switzerland	25 centimes	....	15 centimes (2)	10 centimes	....	5 centimes	....	25 centimes	25 centimes.
Tasmania	2½ pence	25	2½ pence (3)	1 penny	10	½ penny	5	3 pence	2½ pence.
Tobago	do.	25	1½ pence	do.	10	do.	5	2 pence	do.
Union of So. Africa	do.	25	2½ pence (3)	do.	10	do.	5	4 pence	do.
Trinidad	do.	25	1½ pence (1)	do.	10	do.	5	2 pence	do.
Tunis	25 centimes	25	15 centimes (3)	10 centimes	10	5 centimes	5	25 centimes	10 centimes.
Turkey	40 paras	25	30 paras (2)	20 paras	10	10 paras	5	40 paras	40 paras.
Turk's Island	2½ pence	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	2½ pence.
Uruguay	8 centesimos	40	8 centesimos (2)	2 centesimos	10	1 centesimo	10	10 centesimos	5 centesimos.
Venezuela	50 centiemes	50	25 centiemes (2)	15 centiemes	15	10 centiemes	10	50 centiemes	25 centiemes.
Virgin Isles	do.	25	1½ pence (1)	1 penny	10	½ penny	5	2 pence	do.
Zanzibar, British Protectorate	15 hundredths of a rupee	25	9 hundredths of a rupee (1)	6 hundredths of a rupee	10	3 hundredths of a rupee	5	12 hundredths of a rupee	12 hundredths of a rupee.
Zululand	2½ pence	25	2½ pence (3)	1 penny	10	½ penny	5	4 pence	2½ pence.

In the countries and colonies marked (1) the weight-unit is one ounce. In countries and colonies marked (2) the weight-unit is twenty grams or about ¾ ounce. In countries and colonies marked (3) the weight-unit is fifteen grams or about ½ ounce.

* The rate for a reply-paid (double) card is double the rate named in this column.

† U. S. domestic postage rates and conditions.

3½ pence for newspapers.

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A WONDER OF THE MODERN WORLD.

THE WOOLWORTH BUILDING.
Highest Office Building in the World. 51 stories; 750 feet above sidewalk level.

CHAPTER XIII.

PATENTS, TRADE-MARKS, AND COPYRIGHTS.*

Revised by Loyd H. Sutton, of the United States Patent Office.

GENERAL INFORMATION REGARDING PATENTS.

WHAT IS A PATENT?—The term *patent* or *letters patent* is derived from *litterae patentes*, signifying that which is open or disclosed, in contradistinction to *lettre de cachet*, that which is sealed or secret. This term is the keynote of the whole principle upon which the patent system is built up, namely, disclosure. The disclosure must be honest, absolute and unreserved. The penalty for mental crookedness or for ignorance in giving out fully and freely the nature of the invention is severe and direct, and is nothing less than forfeiture of the patent itself. The reason for this is perfectly logical and arises from the very meaning, spirit and nature of the relationship existing between the patentee and the government. The term of a patent is 17 years. During this term of 17 years the patentee obtains a monopoly under which he secures exclusive right of manufacture, use and sale. The patent itself, however, is in the nature of a contract between the patentee and the government, presumably for their mutual benefit. The government grants to the inventor the exclusive right of manufacture and sale for 17 years on condition that the inventor shall disclose fully the nature of his invention or discovery, and shall allow the public the unrestricted use of the invention after this term has expired. If he fail in making full disclosure, he has not lived up to the terms of the implied contract and the patent thereby becomes null and void. It sometimes happens that an inventor discloses freely part of the invention, but cunningly conceals some essential step in the process, but if the case is tested within the courts and the real facts are brought to light, the patent will be declared invalid. At the end of the term of 17 years the patent becomes public property, and the article may be freely manufactured by any one. It can never thereafter, as in so many cases in the Middle Ages, become a lost art.

WHO MAY OBTAIN A PATENT?—In order to secure a valid patent, the applicant must declare upon oath that he believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition or improvement for which he solicits a patent; that he does not know and does not believe that the same was ever before known or used; that the invention has not been in public use or on sale in the United States for more than two years before the application was filed, and not described in any printed publication or patent in this or any foreign country for more than two years prior to the filing of his application; and that the invention has not been patented to himself or to others with his knowledge or consent in this or any foreign country for more than two years prior to his application, or on an application for a patent filed in any foreign country by himself or his legal representatives or assigns more than twelve months prior to his application. Any one who can subscribe to the above conditions may apply for a patent, irrespective of race, color, age or nationality. Minors and women and even convicts may apply for patents under our law. The rights even of a dead man in an invention are not lost, for an application may be filed in his name by his executor or administrator, and the rights of his heirs thereby safeguarded. The patent in this case would issue to the executor or administrator and would become subject to the administration of the estate like any other property left by the de-

* Compiled originally for Munn & Co., Patent Attorneys.

ceased. Even the rights of an insane person may not be lost, as the application may be filed by his legal guardian. If foreign patents for the same invention have been previously issued, having been filed more than twelve months before the filing of the United States application, the patent will be refused. The applicant must state his nationality. It often happens that two or more individuals have jointly worked upon the invention, and in this case the several inventors should jointly apply for the patent. Should they not so apply, the patent when issued will be invalid. If they are merely partners, however, and not co-inventors, they should not apply jointly for a patent, as the inventor alone is entitled to file the application. He may, however, assign a share in the patent to his partner, coupled with the request that the patent should issue to them jointly. It is of the greatest importance that these distinctions should be clearly understood; otherwise, the patent may be rendered invalid.

WHAT MAY BE PATENTED?—Any *new and useful* art, machine, manufacture or composition of matter, or any new and useful improvements thereon. The thing invented must be *new and useful*. These are conditions precedent to the granting of a patent. Of these two conditions by far the more important is the former, and it is concerning the interpretation of this word "*new*" and its bearing upon the invention that the principal work and labor involved in passing an application safely through the Patent Office is involved. When the invention has been worked out by the inventor and he is prepared to file his application, he or his attorney prepares the necessary papers as provided for by law, namely: An Oath, a Petition, a Specification consisting of a description of the invention and concludng with claims which specifically set forth what the inventor claims to be the novel features of the invention, and drawings which are prepared and filed with the case, and in due course the application is ready for examination in the Patent Office. The question of whether the invention is *new* is then considered. The examination consists in searching through the files of the Patent Office among the patents that have been already issued, and through such literature as may bear upon the subject. The question of whether an invention is new is one of fact, and one of the greatest importance, and upon the showing that the inventor is able to make during the prosecution of the case, depends largely the future success of the patent. The evidence adduced in proving that the invention is not new must be tangible and accessible. A patent would not be refused or overturned on a mere mental concept. There must be some evidence of a substantial character that serves to show that the earlier idea was reduced to practice or at least that there was such a description or drawing made as would be sufficient for one skilled in the art to reduce the invention to practice. If it has not been actually reduced to practice, it must be a concrete, not an abstract, idea.

It is essential that the application for a patent should be filed before the invention has been in public use or on sale for a period of two years. If the inventor has publicly used or sold his invention for a period of two years it becomes public property and he cannot regain the right to obtain a patent. He may, however, make models and experiment with his invention for a much longer period, provided he does not disclose his invention to the public or put it into actual use or on sale for a period of two years. The word "useful" is not one which usually gives either the Patent Office or the inventor a great deal of trouble, as any degree of utility, however insignificant, will serve to entitle the inventor to a patent. It has often happened that an invention which appears, at the time the patent is applied for, to have no special utility, in later years, owing to new discoveries or improvements in the arts, is found to possess the greatest merit and value. Unless an invention is positively meretricious, therefore, it is difficult to assume that it either has no utility or never will have any. Patents are granted for "any new and useful art, machine, manufacture or composition of matter, or any improvement thereon." It is seen from the terms of the statute that almost any creature of the inventive faculty of man becomes a proper subject for a patent. The exceptions are very few. Patents will not be granted, for example, for any invention that offends the law of nature. Under this category may be mentioned perpetual motion machines. Inventions of an immoral nature will not be

considered. Medicines and specifics are not now proper subjects for letters patent, unless some important new discovery is involved.

ABANDONED APPLICATIONS.—While abandonment may arise in different ways, its most frequent occurrence results from a failure to properly prosecute the application. An applicant is given one year by the statute in which to respond to an action on his application by the Patent Office. This period of one year runs from the day on which the letter from the Office is dated. If the last day of the year falls on Sunday the applicant's response must be in the Patent Office on the preceding day, i. e., Saturday. Where an applicant waits until the close of the year before acting on his case he does so at considerable risk, and if his response fails to arrive at the Office by the last day of the year little leniency will be shown him in reviving the case except upon a showing of good and sufficient cause. Not only must the applicant's response come within the year, but it must be fully responsive to the last action by the Office. In other words, his action on the application must be all that the state of the case requires as shown by the last Office letter. An abandoned application may be revived upon petition to the Commissioner if the applicant can show that the delay in the prosecution of the case was unavoidable.

APPEALS.—If an application for a patent has been twice rejected, the applicant may appear from the Primary Examiner to the Board of Examiners-in-Chief. He may further carry the appeal to the Commissioner of Patents and in case he is not satisfied with the latter's decision he may carry the appeal finally to the Court of Appeals of the District of Columbia.

INTERFERENCE.—If two or more individuals have made inventions which can be expressed by the same claim or claims, which must be patentable, interference proceedings may be instituted to determine which applicant is the original or first inventor. Interference proceedings are instituted between applicants whose applications are pending or between a pending application and a patent already issued, provided the latter patent has not been issued for more than two years prior to the filing of the conflicting application. The proceedings are conducted before the Examiner of Interferences. Appeal may be taken from the Examiner of Interferences to the Board of Examiners-in-Chief, and from the Board of Examiners-in-Chief to the Commissioner, and thence to the Court of Appeals of the District of Columbia. Not all the claims for a patent are necessarily involved, but only such as cover the particular feature of the invention which is declared to be in interference. The unsuccessful applicant by eliminating the claim or claims in controversy and all other claims readable upon the disclosure of the successful applicant, may procure allowance of other claims in his application. The disclosure of the successful party virtually becomes a part of the prior art and in the further prosecution of the case it will be so treated. In determining the question of priority of invention witnesses are examined and the proceedings are conducted much in the same manner as in a suit at law. The first step in the proceeding consists in filing with the Commissioner a preliminary statement made under oath, giving the date at which the invention was first conceived and reduced to some tangible form, such as the making of drawings, the construction of a model, or the disclosing of the invention to another. The object of the subsequent examination and cross-examination is to substantiate the date of invention as claimed by the applicants respectively, and to establish the priority of invention.

REISSUES.—A reissue is granted to the original patentee, his legal representative or the assignees of the entire interest, when the original patent is inoperative or invalid by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, provided the error has arisen through inadvertence, accident or mistake, and without any fraudulent or deceptive intehtion. The reissue application must be made and the specification sworn to by the inventor or inventors if he or they be living. What is inadvertence, accident or mistake has been the subject of much litigation and as a general rule the courts require a clear showing of such. No new matter can be introduced into the reissue application, but its subject matter must be capable of being found within the four corners of the original

application. As two years' publication of the subject matter of an invention is a bar to the issue of a patent, the courts as a general rule will not sustain a reissue patent the claims of which are broader than those of the original patent where the reissue application is filed more than two years after the grant of the original patent. The original patent must be surrendered when a reissue application is made. The reissue patent is good only for the unexpired term of the original patent.

PATENTED ARTICLES MUST BE MARKED.—Articles manufactured and sold under a patent must be so marked that the public shall have notice that the article is a patented one. This notice consists of the word "Patented," together with the date when the patent was issued. Damages cannot be recovered in an infringement suit unless the patented articles are so marked or it be shown that the defendant was duly notified of his infringement, but continued after such notice to infringe.

INFRINGEMENT.—In case of an action for the infringement of a patent, the importance of the question of novelty appears from the special pleadings which the defendant may enter, which are as follows:

1. That for the purpose of deceiving the public the description and specification filed by the patentee in the Patent Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; or,
2. That he had surreptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or,
3. That it had been patented or described in some printed publication prior to his supposed invention or discovery thereof; or,
4. That he was not the original and first inventor or discoverer of any material and substantial part of the thing patented; or,
5. That it has been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public.

Damages for infringement of a patent may be recovered at law by action on the case, or in equity by bill, in the name of the patentee or his assignee. The courts having jurisdiction over such cases have the power (1) to grant injunctions against the violation of any right secured by the patent; (2) to allow the recovery of damages sustained by the complainant through such infringement, or the profits obtained by the infringer arising from such infringement. The defendant may be compelled to furnish an accounting showing the amount of the articles manufactured and sold and the profits derived from such sale.

DESIGN PATENTS.—Design patents are issued for any new or original design, whether it be a work of art, statue, bas-relief, design for prints or fabrics, or for any new design or shape or ornament in any article of manufacture. The scope of the design patent was formerly very broad, but recent decisions and enactments have greatly restricted its availability and a design patent cannot now be obtained unless it possesses some inherent artistic quality. Mere utility is not sufficient to entitle a new design to letters patent. The terms of design patents are 3½, 7 or 14 years.

ASSIGNMENTS.—A patent or any interest therein may be sold or assigned like any other piece of property. An inventor may sell or assign his interest or a part interest in his invention, either before the application is filed or while the application is still pending. Under these circumstances the patent may be issued to the assignee or to the inventor and assignee jointly. The patent, if already issued, may be assigned by the owner whether he be the inventor or assignee. The conveyance is effected by an instrument in writing stating the conditions under which the patent is assigned, and the assignment should be recorded in the Patent Office to protect the assignee, as the assignment is void as against any subsequent purchase or mortgagee for a valuable consideration unless it is recorded in the Patent Office within three months from the date thereof.

(Note: The provisions of the Patent Statutes relating to the filing of caveats were repealed by Act of July 1, 1910.)

The stamp "Patent Applied For" or "Patent Pending" simply means that an application for patent has been filed in the Patent Office. Action against infringers cannot be taken until the patent actually issues.

MATERIAL FOR FIGURES SHOWING TOTAL NUMBER OF PATENTS TO DECEMBER 31, 1911.

	Issued During Year.		Issued During Year.
1836	109	1883	21,196
1837	436	1884	19,147
1838	515	1885	23,331
1839	404	1886	21,797
1840	458	1887	20,429
1841	490	1888	19,585
1842	488	1889	23,360
1843	494	1890	25,322
1844	478	1891	22,328
1845	475	1892	22,661
1846	566	1893	22,768
1847	495	1894	19,875
1848	584	1895	20,883
1849	988	1896	21,867
1850	884	1897	22,098
1851	757	1898	20,404
1852	890	1899	23,296
1853	846	1900	24,660
1854	1,759	1901	25,558
1855	1,892	1902	27,136
1856	2,315	1903	31,046
1857	2,686	1904	30,267
1858	3,467	1905	29,784
1859	4,165	1906	31,181
1860	4,363	1907	35,880
1861	3,040	1908	32,757
1862	3,221	1909	36,574
1863	3,781	1910	35,168
1864	4,638	1911	32,917
1865	6,099	United States	1,023,051
1866	8,874	France	456,644
1867	12,301	Great Britain	443,035
1868	12,544	Germany	259,634
1869	12,957	Belgium	248,200
1870	12,157	Canada	141,406
1871	11,687	Italy and Sardinia	106,902
1872	12,200	Austria-Hungary	82,933
1873	11,616	Austria	70,463
1874	12,230	Switzerland	53,449
1875	13,291	Hungary	50,474
1876	14,172	Spain	46,915
1877	12,920	Sweden	35,325
1878	12,345	Russia	26,917
1879	12,133	Norway	23,856
1880	12,926	Denmark	23,023
1881	15,548	Japan	21,191
1882	18,135		

THE UNITED STATES PATENT SYSTEM.

The fundamental principles upon which the present commercial supremacy of the United States is based can be found in three provisions of the Constitution: First, the granting of free speech; second, the offer of remuneration for the use of the products of the brain by providing a limited period during which a man shall enjoys the fruits of his efforts; and third, the protection of personal property by the provision that no person shall be deprived of his property without due process of law.

The Constitutional provision mentioned as second is as follows: "The Congress shall have power * * * to promote the progress of Science and Useful Arts by securing for limited Times to Authors and Inventors, the exclusive Right to their respective Writings and Discoveries."

Upon this foundation stands the United States Patent Office, established for the purpose of carrying out the intentions of the framers of the Constitution and developed far beyond their fondest dreams, by American ingenuity and perseverance.

The value of our patent system is eloquently outlined by Senator Platt, of Connecticut. In speaking on a bill for the reorganization of the Patent Office, he said:

"To my mind, the passage of the act of 1836 creating the Patent Office marks the most important epoch in the history of our development—I think the most important

event in the history of our Government from the Constitution until the Civil War. The establishment of the Patent Office marked the commencement of that marvelous development of the resources of the country which is the admiration and wonder of the world, a development which challenges all history for a parallel; and it is not too much to say that this unexampled progress has been not only dependent upon, but has been coincident with, the growth and development of the patent system of this country. Words fail in attempting to portray the advancement of this country for the last fifty years. We have had fifty years of progress, fifty years of inventions applied to the every-day wants of life, fifty years of patent encouragement, and fifty years of a development in wealth, resources, grandeur, culture, power, which is little short of miraculous. Population, production, business, wealth, comfort, culture, power, grandeur, these have all kept step with the expansion of the inventive genius of the country; and this progress has been made possible only by the inventions of its citizens. All history confirms us in the conclusion that it is the development by the mechanical arts of the industries of a country which brings to it greatness and power and glory. No purely agricultural, pastoral people ever achieved any high standing among the nations of the earth. It is only when the brain evolves and the cunning hand fashions labor-saving machines that a nation begins to throb with new energy and life and expands with a new growth. It is only when thought wrings from nature her untold secret treasures that solid wealth and strength are accumulated by a people."

When the Japanese Government was considering the establishment of a patent system, they sent a commissioner to the United States and he spent several months in Washington, every facility being given him by the Commissioner of Patents. One of the examiners said: "I would like to know why it is that the people of Japan desire to have a patent system."

"I will tell you," said Mr. Takahashi. "You know it is only since Commodore Perry, in 1854, opened the ports of Japan to foreign commerce that the Japanese have been trying to become a great nation, like other nations of the earth, and we have looked about us to see what nations are the greatest, so that we could be like them; and we said, 'There is the United States, not much more than a hundred years old, and America was not discovered by Columbus yet four hundred years ago'; and we said, 'What is it that makes the United States such a great nation?' And we investigated and found it was patents, and we will have patents."

The examiner, in reporting this interview, added: "Not in all history is there an instance of such unbiased testimony to the value and worth of the patent system as practiced in the United States."

The demonstration thus given the commercial world during the last three-quarters of a century of the effect of beneficent patent laws has led to their modification in all the chief industrial countries, and the salient feature of our system—a preliminary examination as to novelty and patentability prior to the grant of a patent—has in late years been incorporated into the patent systems of many foreign countries.

The theory of patents is essentially based on the principle of monopoly. Hence we have the nature and scope of patents changing through the centuries with the change in the conception of the rights of the people. In its origin the patent was a royal grant of special privilege to a favored subject in the form of a private monopoly. Political evolution has restricted it to a grant for a limited number of years of an exclusive right to make, use and vend that which is the product of the inventor's brain. The discoverer of new products in the arts, and the inventor of new processes or machines or improvements in machines, adds to the public wealth and is entitled to a protection in their enjoyment as a recompense. The knowledge of this protection acts also as a stimulus to endeavor. Therefore all civilized nations to-day recognize and protect the inventor's rights.

A few patents for inventions were granted by the provincial governments of the American colonies and by the legislatures of the States, prior to the adoption of the Federal Constitution. On the 5th of September, 1787, it was proposed to incorporate in a constitution a patent and copyright clause. The germinating principle of this clause of the Constitution has vitalized the nation, expanded its powers beyond the wildest dreams of its fathers, and from it more than from any other cause, has grown the magnificent manufacturing and industrial development which we to-day present to the world.

President Washington realized the importance of formulating a law to stimulate inventions, and in his first annual message to Congress, in 1790, said:

"I can not forbear intimating to you the expediency of giving effectual encouragement as well to the introduction of new and useful inventions from abroad as to the exertion of skill and genius in producing them at home."

Congress was quick to act, and on April 10, 1790, the first law upon the subject was enacted. It constituted the Secretary of State, the Secretary of War, and the Attorney-General a board to consider all applications for patents. Owing to the fires that have destroyed the early records of the Patent Office, some question has arisen as to the number of patents issued under this act; but from the best information obtainable, the number is

placed at fifty-seven. The first patent issued was to Samuel Hopkins, July 31, 1790, for making pot and pearl ashes.

The archives of the department show that the issuance of a patent in those days was a state occasion. The President and cabinet met in solemn conclave and, after having deliberated upon whether it was proper for the inventor to have the sole right to the manufacture of the child of his brain, presented him with the papers bestowing this privilege upon him. Hopkins was warmly congratulated by President Washington and the event was recorded in all the diaries of those present.

At this period the clerical part of the work preparatory to the issuance of a patent was performed in the State Department. It would be interesting to see Thomas Jefferson, the Secretary of War, and the Attorney-General, critically examining the application and scrutinizing each point carefully and rigorously. The first year the majority of the applications failed to pass the ordeal, and only three patents were granted. In those days every step in the issuing of a patent was taken with great care and caution. Mr. Jefferson always seeking to impress upon the minds of his officers and the public that the granting of a patent was a matter of no ordinary importance.

The act of 1793 superseded the act of 1790, and remained in force as amended from time to time until the act of 1836 was passed. The act of 1793 was the only act ever passed in this country which provided for the issuance of Letters Patent without the requirement of an examination into the novelty and utility of the invention for which the patent was sought.

The act of 1836, with modifications, remained in force until the revision of the patent laws in 1870. This revision was largely a consolidation of the statutes then in force.

Under the revision of the statutes of the United States in 1874 the act of 1870 was repealed; but the revision substantially reenacted the provisions of the act of 1870.

Under the acts of 1790 and 1793 Letters Patent were granted for a term of fourteen years. There was no provision for extension; but while the act of 1793 was in force Congress extended some thirteen patents.

The act of 1836 provided that Letters Patent should be granted for a term of fourteen years, and provision was made for an extension for a term of seven years upon due application and upon a proper showing. Until 1848 petitions for extensions were passed upon by a board consisting of the Secretary of State, the Commissioner of Patents, and the Solicitor of the Treasury. After that time power was vested solely in the Commissioner of Patents.

The patent act of March 2, 1861 (section 16), provided that all patents thereafter granted should remain in force for a term of seventeen years from the date of issue, and the extension of such patents was prohibited.

The consolidated patent act of 1870, while providing that patents should be granted for a term of seventeen years, also provided that patents granted prior to March 2, 1861, might, upon due application and a proper showing, be extended by the Commissioner of Patents for a term of seven years from the expiration of the first term.

By the revision of the patent laws in 1874 the prohibition against the extension of patents was dropped, and since that time Congress has had the power to extend Letters Patent. Congress extended five patents granted under the act of 1836, and in nine instances authorized patentees to apply to the Commissioner of Patents for extension of their patents. So far as one has been able to discover, no patent granted for a term of seventeen years has been extended by Congress.

It was not until 1842 that the statute was passed authorizing the grant of patents for designs. Under that act design patents were granted for seven years. Subsequently provisions were made for granting them for terms of three and one-half, seven, and fourteen years, at the election of the applicant.

By the act of March 2, 1861, the Board of Examiners-in-Chief was established. Prior to that time, and during the incumbency of Commissioner Holt, temporary boards of examiners to decide appeals had been appointed by him, and later on he created a permanent board of three examiners who were to decide on appeal rejected cases and submit their decisions to him for approval.

The act of 1870 made the first provision for an Assistant Commissioner and an Examiner of Interferences. Another provision in that act was the power given the Commissioner, subject to the approval of the Secretary of the Interior, to establish regulations for the conduct of proceedings in the Office.

On January 1, 1898, an act passed March 3, 1897, went into force. Some of the provisions of this act were that applications for patents should be completed and prepared for examination within one year after the filing of the application and that the applicant should prosecute the same within one year after an action thereon or it should be regarded as abandoned (prior to that time two years was the limit); that an inventor should be debarred from receiving a patent if his invention had been first patented by him or his legal representatives or assigns in a foreign country, provided the application for the foreign patent had been filed more than seven months (made twelve months by Act of March 3, 1897), prior to the filing of the application in this country; and that if the invention for which a patent was applied for had been patented or described in any printed publication in this or any foreign country for more than two years prior to the application a patent could not issue.

The first provision for affording accommodations for the Patent Office was in 1810, when Congress authorized the purchase of a building for the General Post-office and for the office of the Keeper of Patents. The building purchased was known as "Blodgett's Hotel," and stood on the site now occupied by the south front of the building until recently occupied by the Post-office Department, and now used by several bureaus of the Interior Department. The east end of this building was used for the records, models, etc., of the Patent Office. This building was destroyed by fire December 13, 1836. On July 4, 1836, an act was passed ap-

propriating $108,000 for the erection of a suitable building for the accommodation of the Patent Office, and within that month the erection of the building was begun.

It was the present south front of the Patent Office, excluding the south ends of the east and west wings. The basement (which is now the first or ground floor) was to be used for storage and analogous purposes, the first or portico floor for office rooms, and the second floor was to be one large hall with galleries on either side, and to have a vaulted roof. This hall was to be used for exhibition purposes, for the display of models of patented and unpatented inventions, and also as a national gallery of the industrial arts and manufactures.

During the erection of the Patent Office building, temporary quarters were provided in the City Hall. In the spring of 1840, the building was completed and the Office moved into it. The sum of $422,011.65 was expended on this building. The patented models were then classified and exhibited in suitable glass cases, while the national gallery was arranged for exhibition of models and specimens.

By the act of March 3, 1849, the Interior Department was established and the Patent Office attached thereto. This same act appropriated $50,000 out of the patent fund to begin the east or Seventh street wing, which was completed in 1852 at a cost of $600,000, $250,000 of which was taken from the revenue of the Patent Office. In 1852 the plans for the entire building, as it now stands, were prepared. The west wing was completed in 1856 and cost $750,000. Work on the north or G street wing was begun the same year. In 1867 this wing was finished at a cost of $575,000. The entire building cost $2,347,011.65.

In May, 1802, President Jefferson appointed Dr. William Thornton as a clerk at $1,400 per year, to have charge of the issuance of patents. He took the title of Superintendent, and continued to act in that capacity until his death, March 28, 1828. He was succeeded by Dr. William P. Jones, who acted until his removal in the early part of President Jackson's administration. John D. Craig followed Dr. Jones, and in 1834 he was succeeded by B. F. Pickett, who served but a brief period. The last Superintendent was Henry L. Ellsworth, who became the first Commissioner under the act of 1836, and served until 1845. The other Commissioners under that act were:

Edmund Burke, May 4, 1845.
Thomas Ewbank, May 9, 1849.
Silas H. Hodges, November 8, 1852.
Charles Mason, May 16, 1853.
Joseph Holt, September 10, 1857.
William D. Bishop, May 27, 1859.
Philip F. Thomas, February 16, 1860.
D. P. Holloway, March 28, 1861.
T. C. Theaker, August 17, 1865.
Elisha Foote, July 29, 1868.
Samuel S. Fisher, April 26, 1869.

Commissioner Fisher continued as Commissioner for a short time under the act of 1870. Other Commissioners under that act have been:

M. D. Leggett, January 16, 1871.
John M. Thacher, November 4, 1874.
R. H. Duell, October 1, 1875.
Ellis Spear, January 30, 1877.
H. E. Paine, November 1, 1878.
E. M. Marble, May 7, 1880.
Benjamin Butterworth, November 1, 1883.
M. V. Montgomery, March 23, 1885.
B. J. Hall, April 12, 1887.
C. E. Mitchell, April 1, 1889.
William E. Simonds, August 1, 1891.
John S. Seymour, March 31, 1893.
Benjamin Butterworth, April 7, 1897.
Charles H. Duell, February 3, 1898.
F. I. Allen, April 11, 1901.
E. B. Moore, June 1, 1907.

Commissioner Fisher was the first to publish his decisions and to have the copies of the specifications and drawings made by photo-lithography. He also instituted the practice of requiring competitive examinations for entrance to and promotions in the examining force of the office.

Beginning in 1843 and annually thereafter the Patent Office reports were published, which, until 1853, contained merely an alphabetical index of the names of the inventors, a list of the expired patents, and the claims of the patents granted during the week. In 1853 and afterwards small engraved copies of a portion of the drawings were added to the reports to explain the claims.

The act of 1870 authorized the Commissioner to print copies of the claims of the current issues of patents and of such laws, decisions, and rules as were necessary for the information of the public. In conformity with this provision there was published weekly a list giving the numbers, titles, and claims of the patents issued during the week immediately preceding, together with the names and residences of the patentees. This list was first published under the name of The Official Gazette of the United States Patent Office, on January 3, 1872. In July, 1872, portions of the drawings were introduced to illustrate the claims in the patented cases. The Official Gazette has now become one of the most valuable and important of Government publications. Each Senator and Representative is authorized to designate eight public libraries to receive this publication free. One copy is also furnished free to each member of Congress. It is also sent all over the world in exchange for similar publications by other Governments, and its paid subscription list is constantly increasing.

Industrial demand and invention go hand in hand. They act and react, being interdependent. Any change in industrial conditions creating a new demand is at once met by the invention of the means for supplying it, and through new inventions new industrial demands are every year being created. Thus through the process of evolution the industrial field is steadily expanding, and a study of the inventions for any decade will point out the lines of industrial growth for the succeeding decade.

The one millionth patent was issued August 8, 1911, to Frank H. Holton of Akron, Ohio, on an improvement in inflated automobile tires. Patent number one had been issued in 1836 to John Ruggles for a locomotive engine. Patent number 500,000 was issued June 20, 1893. It therefore took 57 years to reach the half million number but only 18 years more to reach the whole million number.

The following figures will give an idea of the relative development of American inventions, beginning with 1850, remembering that 9,957 patents were issued up to July 28, 1836, when the present series of patents was commenced, and that 6,980 patents were issued from July 28, 1836 to December 31, 1849

NUMBER OF PATENTS FOR INVENTIONS ISSUED DURING EACH CALENDAR YEAR, AND NUMBER OF LIVE PATENTS AT THE BEGINNING OF EACH CALENDAR YEAR.

Year.	Number of Patents Issued During the Year.	Number of Live Patents.
1850	884	6,987
1851	757	7,769
1852	890	8,099
1853	846	8,474
1854	1,759	8,928
1855	1,892	10,251
1856	2,315	11,673
1857	2,686	13,518
1858	3,467	15,714
1859	4,165	18,714
1860	4,363	22,435
1861	3,040	26,252
1862	3,221	28,795
1863	3,781	31,428
1864	4,638	34,244
1865	6,099	38,034
1866	8,874	43,415
1867	12,301	51,433
1868	12,544	62,929
1869	12,957	73,824
1870	12,157	85,005
1871	11,687	94,910
1872	12,200	104,022
1873	11,616	112,937
1874	12,230	120,551
1875	13,291	128,547
1876	14,172	141,157
1877	12,920	155,200
1878	12,345	168,011
1879	12,133	177,737
1880	12,926	186,408
1881	15,548	195,325
1882	18,135	206,043
1883	21,196	218,041
1884	19,147	230,360
1885	23,331	237,204
1886	21,797	247,991
1887	20,429	256,831
1888	19,585	265,108
1889	23,360	273,001
1890	25,322	284,161
1891	22,328	297,867
1892	22,661	307,965
1893	22,768	317,335
1894	19,875	325,931
1895	20,883	332,886
1896	21,867	341,424
1897	22,098	351,158
1898	20,404	360,330
1899	23,296	365,186
1900	24,660	370,347
1901	25,558	373,811
1902	27,136	380,222
1903	31,046	384,027
1904	30,267	393,276
1905	29,784	403,114
1906	31,181	413,313
1907	35,880	421,134
1908	32,757	431,692
1909	36,574	442,121
1910	35,168	456,034
1911	32,917	468,434
1912	36,231	496,824

The marked growth in the number of patents to aliens to be noted in recent years is explained by the very liberal features of our patent system. Foreigners stand here on an equal footing with citizens of this country, and they are neither subjected to restrictions in the matter of annuities or taxes payable after the grant of a patent, nor required to work an invention in this country to maintain it in force, as is the case in most foreign countries.

Moreover, the thorough examination made by our Patent Office as to the novelty of an invention prior to the allowance of an application for a patent—an examination that includes not only the patents and literature of our own country bearing on the art or industry to which the invention relates, but the patents of all patent-granting countries and the technical literature of the world—and the care exercised in criticising the framing of the claims have come to be recognized as of great value in the case of inventions of merit, and hence the majority of foreign inventors patenting in this country take advantage of this feature of our patent system, and secure the action of the Patent Office on an application for a patent before perfecting their patents in their own and other foreign countries, taking due precaution to have their patents in the different countries so issued as to secure the maximum term in each, so far as possible.

In 1911, 4,058 patents were granted to citizens of foreign countries. The relative distribution is as follows:

Germany	1,820
England	935
Canada	554
France	347
Austria-Hungary	140
Switzerland	108
Other European countries	406
All other countries	248

The working of an invention has never been required under our patent laws, though in most foreign countries an invention must be put into commercial use in the country within a specified period or the patent may be declared void. In the case of patents for fine chemicals and like products, which require a high order of technical knowledge and ability for their inception, and skilled workmen for their manufacture, the effect of this requirement, that the industry must be established within the country, has

been most salutary in building up chemical industries within the home country, to some extent at the expense of other countries where the working of a patent is not obligatory. This shows most strongly in the case of carbon dyes and in the patents for chemicals of the class known as carbon compounds, which includes numerous pharmaceutical and medicinal compounds of recent origin, aldehydes, alcohols, phenols, ethers, etc., and many synthetic compounds, as vanillin, artificial musk, etc.

Late years have shown a greatly increased number of patent applications filed by women. With the increase in number there has been a corresponding broadening of the field of their endeavors. When the 1910 census came to the question of patents it listed 944,525 patents granted to men in this country since the beginning of the patent system, but 8,596 patents were credited to women, nine-tenths of one per cent. of the total issue. But the percentage of patents granted to woman increases yearly. Thus, from 1790 until 1888 there were 2,455 patents granted women, and from 1888 to 1895, 2,526, in seven years more than doubling the total that had been accruing for the previous ninety-eight years. And from 1895 until 1910 there were 3,615 patents more, bringing the total number up to 8,596, as stated.

In the presence of much discussion of the relative protection which the several sections of the United States receive under our patent system, it will be instructive to consider the distribution of patents granted during a normal year. The table below shows the states and territories arranged in an order showing the ratio of patents granted in 1911 to the population of the several states and territories.

States and Territories.	Patents and Designs.	One to every—
1. Connecticut	845	1,319
2. District of Columbia	239	1,385
3. California	1,575	1,516
4. Colorado	477	1,675
5. Rhode Island	315	1,723
6. Illinois	3,172	1,778
7. Massachusetts	1,842	1,828
8. New Jersey	1,360	1,866
9. New York	4,777	1,908
10. Nevada	39	2,099
11. Ohio	2,233	2,135
12. Pennsylvania	2,919	2,626
13. Michigan	1,035	2,715
14. Oregon	246	2,735
15. Washington	410	2,785
16. Idaho	105	3,101
17. Wisconsin	703	3,320
18. Montana	112	3,357
19. Missouri	945	3,486
20. Delaware	56	3,613
21. Utah	103	3,624
22. Indiana	726	3,720
23. Nebraska	318	3,749
24. Iowa	583	3,816
25. Minnesota	475	4,370
26. North Dakota	132	4,372
27. Kansas	382	4,427
28. Maryland	272	4,762
29. Arizona	41	4,984
30. Maine	142	5,228
31. New Hampshire	81	5,316
32. South Dakota	109	5,357
33. Wyoming	26	5,614
34. Vermont	61	5,835
35. West Virginia	196	6,230
36. New Mexico	50	6,546
37. Texas	591	6,593
38. Oklahoma	235	7,052
39. Florida	104	7,237
40. Virginia	226	9,122
41. Kentucky	240	9,541
42. Louisiana	165	10,039
43. North Carolina	191	11,551
44. Georgia	224	11,647
45. Arkansas	135	11,663
46. Tennessee	175	12,484
47. Alaska	5	12,871
48. Alabama	163	13,117
49. Mississippi	113	15,904
50. South Carolina	65	23,314

Attention is now directed to how a patent is obtained under the system in the United States. We will suppose a new form of door hinge has been invented. What is the procedure that the inventor should resort to?

In the first place it is highly desirable to employ a *competent attorney*, one skilled in the patent law and practice. The inventor may prepare and prosecute his own application and his case will receive the same careful attention in the Patent Office as if he had employed an attorney. But it should not be forgotten that *Patent practice is technical.* The change of a word here and there may make the difference between *protection* and *no protection.* If the invention is worth patenting it is worth as good a patent as is obtainable, and the inventor should not forget that the patent may have to go through the mill of technical construction in the courts at great expense.

Then a preliminary search should be made. The applicant can make such at the Patent Office or his attorney will have such made. This search is made for the purpose of determining if the device is old. Again it should be remembered that many patents are never used as a basis for manufacture for one reason or another, so that, while the inventor may never have seen a device like that

which he has devised and may have produced it from wholly original thought and experiment, yet someone else may have reached the same result before, patented it, and then done nothing more with it.

Assuming that the preliminary search brings forth no device like the hinge under discussion the next thing is to prepare the application papers. These include a petition, an oath, a drawing, a specification and claims.

The petition is addressed to the Commissioner of Patents setting forth applicant's residence and other formal matters and prays the grant of letters patent. The oath states that applicant believes himself to be the original, first and sole inventor and the other statutory prerequisites. Forms for both are given in a publication entitled "Rules of Practice in the United States Patent Office," which may be obtained from the Patent Office or these forms will be prepared for execution by the attorney.

The drawing must be of a prescribed size and clearly illustrate the construction of the device.

The specification is a detailed description of the device referring to lettered or numbered parts of the drawing, for amplification. The description and drawing must contain a disclosure of the construction, nature and use of the device so full, clear and complete as to enable others skilled in the art to make and use the same, for the public must be informed that they may make and use the device after the patent has expired.

The claims are short statements, drawn in *technical form*, setting forth the elements of the machine or improvement or the steps of the process that applicant believes he has invented. These should be as broad as the state of the art warrants, and should be drawn with very great care to be of any value. Only one skilled in patent practise should undertake the preparation of claims. Too much emphasis cannot be laid on this point.

These application papers, together with $15 for a filing fee, are now to be sent to the Patent Office. Here they are received by the Application Division and duly recorded in books kept for that purpose, and each application is given its serial number. The application is then sent to that division in the office where devices of that nature are examined and given to an examiner skilled in the art to which the device appertains. Then begins the prosecution of the case. The first step is to make an examination of the case.

The American patent system is known as the examination system because of the careful examination given each application to determine the validity of the claims presented for patenting. The examination system is the ideal system, provided the examination can be made with sufficient care to minimize the likelihood of the issue of patents for inventions not of a patentable nature. The field of search, however, yearly increases, and it becomes more and more difficult through lack of time to make a perfect examination. Something more than three million domestic and foreign patents have been issued, while the number of scientific publications has enormously increased. It is only by means of a perfect classification that this great mass of matter can be so divided as to be conveniently accessible for use in the examination of any individual case.

The claims are compared with the disclosures of these United States and foreign patents to see if they are met in terms by devices old in the art. If so they are rejected, and the applicant is so informed, and the patents or publications, together with the reasons if they are not self-evident, are enumerated in a letter written from the office.

Applicant has then one year in which to take action on his case. He may amend his claims to avoid the references cited or he may ask for reconsideration. The application is then taken up for further examination.

During the prosecution of the case questions of interference, appeal, petition, etc., may arise. The procedure in such events is more or less technical and unless applicant has employed an attorney he should study carefully the "Rules of Practice," before heferred to, for instructions. The nature of this section will not admit of further detail in meeting the very great number of different situations that may arise.

Assuming, however, that the claims are found to be patentable and the specification and claims unobjectionable in form, the application is passed to issue. The application is sent to the Issue and Gazette Division and

the applicant is informed that the patent will issue upon the receipt of the final fee of $20. He has six months in which to pay this fee. When paid the application is given its patent number, the specification and claims are printed, the drawing is photolithographed and the printed copy and the drawing, together with a copy of the form of patent grant with seal affixed, is sent to the Commissioner for his signature. The patent has then issued and is sent to the inventor.

The country is enriched by inventions and offers for them a small premium; this premium is a seventeen years' monopoly of their fruit—no more, no less. Having purchased the invention for this insignificant price, the purchase is consummated by the publication in the patent records of the details of the invention so that he who runs may read. The whole thing is a strictly business transaction, and this character is emphasized by the fact that the inventor is required to pay for the clerical and expert labor required to put his invention into shape for issuing. His patent fees are designed to cover this expense, and do so, with a considerable margin to spare. Thus the people of the United States are perpetually being enriched by the work of inventors, at absolutely no cost to themselves.

The inventor does not work for love nor for glory alone, but in the hopes of a return for his labor. Glory and love of his species are elements actuating his work, and in many cases he invents because he cannot help himself —because his genius is a hard task master and keeps him at work. But none the less, the great incitement to invention is the hope of obtaining a valuable patent, and without this inducement inventions would be few and far between, and America would, without the patent system, be far in arrears of the rest of the world, instead of leading it, as it does to-day. The few pregnant sentences of the patent statutes—sentences the force of whose every word has been laboriously adjudicated by our highest tribunal, the Supreme Court of the United States—are responsible for America's most characteristic element of prosperity, the work of her inventors, to whom belongs the credit.

It should continue to be the policy of the government of a nation whose inventors have given to the world the cotton gin and the reaper, the sewing machine and the typewriter, the electric telegraph and telephone, the rotary web perfecting printing press and the linotype, the incandescent lamp and the phonograph, and thousands of other inventions that have revolutionized every industrial art, to encourage invention in every lawful way and to provide that, so far as may be necessary, the money paid to the Government by inventors be used for their benefit. The wisdom of the policy has been demonstrated.

The world owes as much to inventors as to statesmen or warriors. To them the United States is the greatest debtor, so much have they advanced American manufactures. Their labor-saving machinery does work that it would take millions of men using hand implements to perform. In this century the debt will be piled still higher, for inventors never rest.

DISTINGUISHED AMERICAN INVENTORS.

Benjamin Franklin; b. Boston, 1706; d. 1790; at 12, printer's apprentice, fond of useful reading; 27 to 40, teaches himself Latin, etc., makes various useful improvements; at 40, studies electricity; 1752, brings electricity from clouds by kite, and invents the lightning rod.

Eli Whitney, inventor of the cotton-gin; b. Westborough, Mass., 1765; d. 1825; went to Georgia 1792 as teacher; 1793, invents the cotton-gin, prior to which a full day's work of one person was to clean by hand one pound of cotton; one machine performs the labor of five thousand persons; 1800, founds Whitneyville, makes firearms, by the interchangeable system for the parts.

Robert Fulton; b. Little Britain, Pa., 1765; d. 1825; artist painter; invents steamboat 1793; invents submarine torpedoes 1797 to 1801; builds steamboat in France 1803; launches passenger boat Clermont at N. Y. 1807, and steams to Albany; 1812, builds steam ferry-boats; 1814, builds first steam war vessel.

Jethro Wood, inventor of the modern cast-iron plough; b. White Creek, N. Y., 1774; d. 1834; patented the plough 1814; previously the plough was a stick of wood plated with iron; lawsuits against infringers consumed his means; Secretary Seward said: "No man has benefited the country pecuniarily more than Jethro Wood, and no man has been as inadequately rewarded."

Thomas Blanchard; b. 1788, Sutton, Mass.; d. 1864; invented tack machine 1806; builds successful steam carriage 1825; builds the stern-wheel boat for shallow waters, now in common use on Western rivers; 1843, patents the lathe for turning irregular forms, now in

common use all over the world for turning lasts, spokes, axe-handles, gun-stocks, hat-blocks, tackle-blocks, etc.

Ross Winans, of Baltimore; b. 1798, N. J.; d. 1877; author of many inventions relating to railways; first patent, 1828; he designed and patented the pivoted, double truck, long passenger cars now in common use. His genius also assisted the development of railways in Russia.

Cyrus H. McCormick, inventor of harvesting machines; b. Walnut Grove, Va., 1809; d. 1884; in 1851 he exhibited his invention at the World's Fair, London, with practical success. The mowing of one acre was one man's day's work; a boy with a mowing machine now cuts 10 acres a day. Mr. McCormick's patents made him a millionaire.

Charles Goodyear, inventor and patentee of the simple mixture of rubber and sulphur, the basis of the present great rubber industries throughout the world; b. New Haven, Conn., 1800; d. 1860; in 1839, by the accidental mixture of a bit of rubber and sulphur on a red-hot stove he discovered the process of vulcanization. The Goodyear patents proved immensely profitable.

Samuel F. B. Morse, inventor and patentee of electric telegraph; b. Charlestown, Mass., 1791; d. 1872; artist painter; exhibited first drawings of telegraph 1832; half-mile wire in operation 1835; caveat 1837; Congress appropriated $30,000 and in 1884 first telegraph line from Washington to Baltimore was opened; after long contests the courts sustained his patents and he realized from them a large fortune.

Elias Howe, inventor of the modern sewing machine; b. Spencer, Mass., 1819; d. 1867; machinist; sewing machine patented 1846; from that time to 1854 his priority was contested and he suffered from poverty, when a decision of the courts in his favor brought him large royalties and he realized several millions from his patent.

James B. Eads; b. 1820; d. 1887; author and constructor of the great steel bridge over the Mississippi at St. Louis, 1867, and the jetties below New Orleans, 1876. His remarkable energy was shown in 1861 when he built and delivered complete to the Government, all within sixty-five days, seven iron-plated steamers, 600 tons each; subsequently other steamers. Some of the most brilliant successes of the Union arms were due to his extraordinary rapidity in constructing these vessels.

Prof. Joseph Henry; b. Albany, N. Y., 1799; d. 1878; in 1828 invented the present form of the electro-magnet which laid the foundation for practically the entire electrical art and is probably the most important single contribution thereto. In 1831 he demonstrated the practicability of the electric current to effect mechanical movements and operate signals at a distant point, which was the beginning of the electro-magnetic telegraph; he devised a system of circuits and batteries, which contained the principle of the relay and local circuit, and also invented one of the earliest electro-magnetic engines. He made many scientific researches in electricity and general physics and left many valuable papers thereon. In 1826 he was a professor in the Albany Academy; was Professor of Natural Philosophy at the College of New Jersey in 1832, and in 1846 was chosen secretary of the Smithsonian Institution at Washington, where he remained until his death. Prof. Henry was probably the greatest of American physicists.

Dr. Alexander Graham Bell, the inventor of the telephone; b. 1847 at Edinburgh, Scotland, moved to Canada 1872 and afterwards to Boston; here he became widely known as an instructor in phonetics and as an authority in teaching the deaf and dumb; in 1873 he began the study of the transmission of musical tones by telegraph; in 1876 he invented and patented the speaking telephone, which has become one of the marvels of the nineteenth century and one of the greatest commercial enterprises of the world; in 1880 the French Government awarded him the Volta prize of $10,000 and he has subsequently received the ribbon of the Legion of Honor from France and many honorary degrees, both at home and abroad; Dr. Bell still continues his scientific work at his home in Washington and has made valuable contributions to the phonograph and aerial navigation.

Samuel Colt; b. Hartford, Conn., 1814; d. 1862; he studied chemistry and became a lecturer on that subject; in 1835 he secured patents on a revolving pistol, a model of which he had made while a boy when at sea; he built and maintained a large armory in Hartford, Conn; in 1847 he contracted to make 1,000 weapons for General Taylor; in 1843 he laid and successfully tested the first submarine telegraph cable.

Thomas A. Edison; b. 1847, at Milan, Ohio; from a poor boy in a country village, with a limited education, he has become the most fertile inventor the world has ever known; his most important inventions are the phonograph in 1877, the incandescent electric lamp, 1878; the quadruplex telegraph, 1874-1878; the electric pen, 1876; magnetic ore separator, 1880; and the three-wire electric circuit, 1883; his first patent was an electric vote-recording machine, taken in 1869; early in life Edison started to run a newspaper, but his genius lay in the field of electricity, where as an expert telegrapher he began his great reputation; his numerous inventions have brought him great wealth; a fine villa in Llewellyn Park, at Orange, N. J., is his home, and his extensive laboratory near by is still the scene of his constant work; he is the world's most persevering inventor, and there are few fields of work into which his inventive genius has not entered; in late years he has done much work in connection with the preparation of detachable molds for cement houses.

Captain John Ericsson; b. 1803 in Sweden; d. in New York, 1889; at 10 years of age, designed a sawmill and a pumping engine; made and patented many inventions in England in early life; in 1829 entered a locomotive in competition with Stephenson's Rocket; in 1836 patented in England his double-screw propeller and shortly after came to the United States and incorporated it in a steamer; in 1861, built for the United States Government the turret ironclad Monitor; was the inventor of the hot-air engine which bears his name; also a torpedo boat which was designed to discharge a torpedo by means of compressed air beneath the water; he was an indefatigable worker and made many other inventions; his diary, kept daily for 40 years, comprehended 14,000 pages.

Charles F. Brush; b. near Cleveland, Ohio, 1849; prominently identified with the development of the dynamo, the arc light and the storage battery, in which fields he made many important inventions; in 1880 the Brush Company put its electric lights into New York City and has since extended its installations into most of the cities and towns of the United

States; in 1881, at the Paris Electrical Exposition, he received the ribbon of the Legion of Honor.

George Westinghouse, Jr.; b. at Central Bridge, N. Y., 1846; while still a boy he modeled and built a steam engine; his first profitable invention was a railroad frog; his most notable inventions, however, were in railroad airbrakes, the first patents for which were taken out in 1872; the system now known by his name has grown to almost universal adoption and constitutes a great labor saving and life saving adjunct to railroad transportation; Mr. Westinghouse, whose home is at Pittsburg, was one of the earliest to develop and use natural gas from deep wells; in late years he has made and patented many inventions in electrical machinery for the development of power and light, and has commercially developed the same on a large scale.

Ottmar Mergenthaler; b. 1854, at Wurtemberg, Germany; d. 1899; inventor of the linotype machine; his early training as a watch and clock maker well fitted him for the painstaking and complicated work of his life, which was to make a machine which would mold the type and set it up in one operation; in 1872 Mergenthaler came to Baltimore and entered a machine shop, in which he subsequently became a partner; the first linotype machine was built in 1886 and put to use in the composing room of the New York Tribune; to-day all large newspapers and publishing houses are equipped with great batteries of these machines, costing over $3,000 each, and each performing the work of five compositors.

Nicola Tesla; b. in the border country of Austria-Hungary, 1857; his first invention, made at Budapest, Hungary, in 1881, was a telephone repeater; he came to the United States in 1884 and later became a naturalized citizen; his work has been largely in electrical fields, but of late he has done much work in the direction of developing steam turbines.

Emile Berliner; b. in Hanover, Germany, May 20, 1851; he invented the loose contact telephone transmitter and many other important improvements in telephone; in 1887 he invented the gramophone, the talking machine well known as the Victor type; he was awarded the John Scott medal by the Franklin Institute.

Wilbur Wright; b. in Henry County, Ind., April 16, 1867; d. May 30, 1912; Orville Wright; b. Aug. 19, 1871; the Wright brothers became interested in mechanical flight in 1896; at the suggestion of Prof. S. P. Langley, Secretary of the Smithsonian Institution, they went to the sand hills of Killdevil, N. C., in 1900, to carry out a series of field experiments; they developed a motor far in advance of those before used in connection with mechanical flight and by 1905 they had a flying machine in which they flew nearly 35 miles at Dayton, Ohio; the first public exhibition of importance was given in this country at Fort Myer in 1908 by Orville Wright; Wilbur Wright at this time was making record flights at Le Mans, France; from then until Wilbur's death the two were constantly associated in developing their heavier than air machines; they became the world's best known aviators.

ABSTRACTS OF DECISIONS.

Where an inventor has completed his invention, if he neither applies for a patent nor puts it to practical use, a subsequent inventor who promptly applies is entitled to the patent, and the first one is deemed to have abandoned his rights. Pattee v. Russell, 3 O. G., 181; Ex parte Carre, 5 O. G., 30; Johnson v. Root, 1 Fisher, 351.

As between two rival inventors, the test of priority is the diligence of the one first to conceive it. If he has been diligent in perfecting it, he is entitled to receive the patent. If he has been negligent, the patent is awarded to his opponent. Robinson on Patents, Sec. 375.

The construction and use for two years in public of a working machine, whether the inventor has or has not abandoned it, excludes the grant of a patent to a subsequent inventor. An abandonment in such case inures to the benefit of the public and not to the benefit of a subsequent inventor. Young v. Van Duser, 16 O. G., 95.

Just where the line of invention lies in an accomplished result is frequently difficult for the courts to determine. That it must extend beyond the merely novel and useful and into the domain of original thought has been determined. The extent of the mental process, however, is immaterial. The result may come out of long consideration or it may be the revelation of a flash of thought. Snyder v. Fisher, 78 O. G., 485.

A function result or principle is not patentable, but a party is entitled to claim his invention as broadly as the prior art permits. Ex parte Pisko, 113; Gourick, 85-15.

It is well settled law that a patent can not issue for a result sought to be accomplished by the inventor of a machine but only for the mechanical means or instrumentalities by which that result is obtained. One cannot describe a machine which will perform a certain function and then claim the function itself and all other machines that may be invented by others to perform the same function. In re Gardner, 140 O. G., 258.

A mere aggregation or combination of old devices is not patentable when the elements are unchanged in *function and effect.* They are patentable when, "by the action of the elements upon each other, or by their joint action on their common object, they perform additional functions and accomplish additional effects." Robinson on Patents, Sec. 154.

A change of shape enabling an instrument to perform new functions is sometimes invention. Wilson v. Coo, 18 Blatch, 532; Collar Co. v. White, 7 O. G., 690, 877.

A patent which is simply for a method of transacting business or keeping accounts is not valid. U. S. Credit System Co. v. American Indemnity Co., 63 O. G., 318.

The mere combination of articles disclosed in two former patents will not constitute invention, unless it results in producing a new and useful article not applied by those familiar with the state of the art. In re Faber, 136 O. G., 229.

Patentable novelty may be found in an improvement which simplifies a complicated train of mechanism by eliminating some of the elements with the result that defects due

to the presence of those elements are done away with. Brown v. Huntington Piano Co., 134 Fed., 735.

It involves no invention to omit a part together with its function. Ex parte McElroy, 161 O. G., 753.

Where the claims are distinguishable over the prior art by mere arbitrary variations which amount only to changes of mechanical design and which accomplish no new result, held that such claims are unpatentable. Ex parte Hill, 117 O. G., 2365.

The substitution of one material for another involves invention where the substituted material is used in a relation in which it had not before been used and in which it accomplished new and very beneficial results which were long sought by those skilled in the art. George Frost Co. et al v. Cohn et al, 119 Fed., 505.

There is no invention apparently involved in putting some other mechanism well known in the art and well adapted for such use in the place of previously used mechanism in an old device operating in an old way when such substitution does not involve any material rearrangement. New Departure Bell Co. v. Bevin Bros. Manufacturing Co. 75 O. G.,2196.

Mere change of proportion is not sufficient to avoid a charge of infringement and is not, therefore, sufficient to establish difference of invention. Thompson-Houston Electric Co. v. Western Electric Co. et al. 75 O. G., 347.

In claiming a patent for the discovery of a useful result in any art, machine, manufacture or composition of matter by the use of certain means, the applicant must specify the means he uses in a manner so full and exact that any one skilled in the science to which it appertains can by using the means he specifies without any addition or subtraction from them produce precisely the result he describes. In re Blackmore, 140 O. G., 1209.

A patentee is bound by the limitations imposed on his patent, whether they are voluntary or enforced by the Patent Office, and if he accepts claims not covering his entire invention he abandons the remainder. Toepfer v. Goetz, 41 O. G., 933.

Claims should be construed, if possible, to sustain the patentee's right to all he has invented. Ransom v. Mayor of N. Y. (1856), Fisher, 252.

The law requires that manufacturers of patented articles give notice to the public that the goods are patented by marking thereon the date of the patent or giving equivalent notice. When this law is not complied with, only nominal damages can be recovered. Wilson v. Singer Mfg. Co., 4 Bann. & A. 637; McCourt v. Brodie, 5 Fisher, 384.

To prevent fraudulent impositions on the public it is forbidden that unpatented articles be stamped "Patented," and where this is done with intention to deceive, a penalty of one hundred dollars and costs for each article so stamped is provided. Any person may bring action against such offenders. Walker v. Hawxhurst, 5 Blatch. 494; Tompkins v. Butterfield, 25 Fed. Rep 556.

The assignor of a patented invention is estopped from denying the validity of his own patent or his own title to the interest transferred. He cannot become the owner of an older patent and hold it against his assignee. Robinson on Patents, Sec. 787, and notes.

Any assignment which does not convey to the assignee the entire and unqualified monoply which the patentee holds in the territory specified, or an undivided interest in the entire monoply, is a mere license. Sanford v. Messer, 2 O. G., 470.

Where a patented machine was sold by complainant with a license agreement that it was to be used only with ink made by complainant and defendant with knowledge of such license agreement sold to the owner of such machine, ink not made by complainant with the expectation that this ink was to be used in connection with such machine, held that the acts of defendant constituted contributory infringement of complainant's patent. U. S. Supreme Court. Henry et al v. A. B. Dick Co., 176 O. G., 751.

FOREIGN PATENTS.

Canada, Dominion of.—The laws of Canada follow somewhat closely the practice in the United States. The term of a patent is eighteen years. The general practice, however, is to divide the fees, making payment only for a term of six years at one time. Applications are subjected to examination as to novelty and usefulness, as in the United States. The application must be filed in Canada not later than during the year following the issue of the United States or other foreign patent. If the inventor neglects to file his application within the twelve months, the invention becomes public property. It is not permissible to import the patented article into the Dominion after twelve months from the date of the Canadian patent. Within two years from said date the manufacture and sale of the article under the patent must have been begun. These exactions may be relaxed under certain conditions.

Great Britain.—The term of the patent is fourteen years. An examination is made in Great Britain to ascertain whether the invention has been disclosed in the specifications of British patents granted within fifty years of the filing of the British application. While this is the extent of the examination by the Patent Office, it is sufficient to invalidate a British patent to show in court that the invention was published, or was in public use, in Great Britain before the date of the invention of the British application. In Great Britain the true inventor should apply for the patent in his own name; but if the invention has been conceived in a foreign country, the first introducer may obtain the patent whether he be the true inventor or not. Under these circumstances, therefore, a foreign assignee may apply for the patent in his own name without the true inventor being known. After the fourth year there are annual taxes, gradually increasing in amount. The patent becomes void if the tax is not paid. No time is set within which the manufacture of the invention must be commenced, but after three years if the manufacture has not begun, the patentee may be com-

METROPOLITAN LIFE BUILDING.

SINGER BUILDING.

Photographs to scale ⅞ inch=100 feet.

pelled to grant licenses, or the patent may be declared invalid.

FRANCE.—The term of a patent is fifteen years. There is no examination as to novelty, and the patent is granted to the first applicant, whether or not he be the true inventor. The life of the patent depends upon the payment of annual taxes. The patent must be worked in France within two years from the date of the signing of the patent. If these conditions are not complied with the patent becomes public property but the working provisions referred to are modified by the terms of the International Convention, under which the revocation of a French patent is prevented when the patent is granted to a citizen of a country which is a member of the Convention until after the expiration of the third year counting from the filing of the French application.

GERMANY.—The term of a patent is fifteen years. The patent is issued to the first applicant, but if he is not the true inventor he should, before filing the application, obtain the written consent of the inventor. The application is subjected to a rigid examination. The patent is subject to an annual progressive tax, and must be worked within a period of three years but the working provisions in Germany are modified by a treaty between the United States and Germany, under the provisions of which the revocation of a German patent granted to a citizen of the United States is prevented when the patented article is manufactured in the United States.

AUSTRIA.—The term of a patent is fifteen years. The practice is somewhat similar to the practice in Germany, although the examination is generally not so exacting. The patent is subject to an annual tax and it must be worked within a period of three years.

HUNGARY.—The term of a patent is fifteen years. The laws are similar to those of Germany. There is a progressive annual tax and the patent must be worked within a period of three years.

BELGIUM.—The term of a patent is twenty years. The first applicant obtains the patent whether or not he is the true inventor. There is a small annual tax, and the patent should be worked within one year of the working elsewhere but the working provisions in Belgium are modified under the terms of the International Convention which prevent the revocation of a Belgian patent granted to a citizen of a country which is a member of the Convention until after the expiration of three years counting from the filing of the Belgian patent Application.

ITALY.—The maximum term of a patent is fifteen years. The patent is granted to the first applicant. The patent is subject to an annual tax. The patent becomes invalid if it is not worked within one year or if work under it has been suspended for a whole year, where the term is five years or less; or, where the term is more than five years, if it is not worked within two years or work under it has been suspended for two years but the working provisions in Italy are modified by the provisions of the International Convention, with reference to which see "France," referred to above.

RUSSIA.—The term of the patent is fifteen years. The patent is subject to the payment of annual taxes and must be worked within five years.

SPAIN.—The term of the patent is twenty years, subject to the payment of annual taxes. It must be worked within two years. The patent is issued to the first applicant, whether or not be the true inventor. The working provisions are modified under the terms of the International Convention.

SWITZERLAND.—The term of the patent is fifteen years, subject to an annual tax. Working must take place within three years. The true inventor or his assignee can obtain a patent but when the Swiss patent is granted to a citizen of the United States it is unnecessary for him to work the patent provided the invention is being worked in the United States.

NORWAY.—The term of a patent is fourteen years. The patent is subject to a small annual tax. The application must be filed in the name of the true inventor or his assignee. Applications must be filed within twelve months of the publication of the patent in any foreign country. The patentee may be compelled to grant licenses. The application must be filed either before the issue of the United States patent or during the year following the filing of the United States application.

SWEDEN.—The term of a patent is fifteen years. The patent is subject to an annual tax. The conditions are similar to those existent in Norway. Working is not now necessary in Sweden, but the patentee may be compelled to grant licenses should he fail to carry on the manufacture in Sweden.

DENMARK.—The laws are similar to those of Sweden but the patent should be worked within three years.

PORTUGAL.—The term of the patent varies from one to fifteen years, the fees payable depending upon the term of the patent. A patent must be worked within two years but the working provisions are modified by the provisions of the International Convention under which the working is not required when the patentee is a citizen of a country which is a member of the Convention until after the expiration of three years from the date of filing of the application in Portugal.

NETHERLANDS.—The term of a patent is fifteen years. The patent is granted to the first applicant. The patentee must have a bona fide industrial establishment where the patented article is manufactured within five years or the patent is revocable. The patent is subject to an annually increasing tax.

AUSTRALIA.—The Australian patent protects an invention in Victoria, New South Wales, Queensland, South Australia, Tasmania, West Australia and Papua, but not in New Zealand, which has its own patent law. The term of the Australian patent is fourteen years, a tax being due before the expiration of the seventh year. When the patent is not worked a compulsory license or revocation of the patent may be enforced after two years from the granting of the patent but Australia is a member of the International Convention, and the working provisions are therefore modified by the terms of the convention.

NEW ZEALAND.—The term of the patent is fourteen years, taxes being due before the end of the fourth and seventh years. Compulsory licenses may be obtained.

BRITISH INDIA.—The patent is granted for fourteen years with a possible term of extension. The application should be filed within one year of the issue of the patent in any other country and before the invention has been publicly used or made publicly known in any part of British India. Taxes are payable before the end of the fourth year and annually thereafter. If the patent is not worked to an adequate extent within four years the patentee may be compelled to grant licenses to prevent the revocation of the patent.

TURKEY.—Patents are granted for five, ten or fifteen years. The application must be filed by the inventor or his assignee. The patent is subject to an annual tax. The patent must be worked within two years.

PORTO RICO.—Protection is secured by filing a certified copy of the United States patent with the Secretary of the Government and by complying with certain legal formalities.

PHILIPPINES.—The modus operandi is the same as that just described as applying to Porto Rico.

CUBA.—Since Cuba has become an independent republic it has established a patent system. The term of the patent is seventeen years. Working should be established within one year but the term for the working of the Cuban patent is modified by the provisions of the Convention. No taxes after the issue of the patent.

MEXICO.—The term is twenty years. The application must be filed in Mexico either within twelve months from the date of filing of the first application in another country or within three months from the date of issue of the foreign patent. There are no taxes after the issue of the patent. If the Mexican patent is not worked the patentee may be required, after the expiration of three years of the patent term, to grant licenses permitting others to manufacture in Mexico.

SOUTH AMERICAN REPUBLICS.—Patents are issued by all of the South American Republics. The principal countries in which patent protection is sought are Brazil, in which the laws are quite favorable to foreigners and where the term is fifteen years; Chile, where the term is generally ten years, and Argentina, where the terms are five, ten and fifteen years, according to the merits of the invention. Patents are also frequently secured in Venezuela, Peru, Ecuador, Colombia and Paraguay, but only for certain classes of invention, owing to the expense involved in procuring the patents.

SOUTH AFRICA.—Patents are obtainable in four important states. Cape Colony, Transvaal, Congo Free State and Orange Free State. In Cape Colony the term is fourteen years. There are no conditions as to working the patent. The law is otherwise similar to that of Great Britain.

JAPAN.—The term of the patent is fifteen years. The applicant must be the inventor or derive his title from the inventor. There is an examination of the application. The patent is subject to an increasing tax, and must be worked within three years. The taxes for the first, second and third years of the patent term are paid before the patent is issued. The subsequent taxes are paid annually after the expiration of the third year of the patent term.

THE PATENT LAWS OF THE UNITED STATES.

The Constitutional Provision.—The Congress shall have power * * * to promote the progress of Science and Useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.

STATUTES.

ORGANIZATION OF THE PATENT OFFICE.

Title XI, Rev. Stat., p. 80:

Sec. 475. There shall be in the Department of the Interior an office known as the Patent Office, where all records, books, models, drawings, specifications, and other papers and things pertaining to patents shall be safely kept and preserved.

Sec. 476. There shall be in the Patent Office a Commissioner of Patents, one Assistant Commissioner, and three examiners-in-chief, who shall be appointed by the President, by and with the advice and consent of the Senate. All other offices, clerks and employees authorized by law for the Office shall be appointed by the Secretary of the Interior, upon the nomination of the Commissioner of Patents.

Sec. 480. All officers and employees of the Patent Office shall be incapable, during the period for which they hold their appointments, to acquire or take, directly or indirectly, except by inheritance or bequest, any right of interest in any patent issued by the Office.

Sec. 481. The Commissioner of Patents, under the direction of the Secretary of the Interior, shall superintend or perform all duties respecting the granting and issuing of patents directed by law; and he shall have charge of all books, records, papers, models, machines, and other things belonging to the Patent Office.

Sec. 482. The examiners-in-chief shall be persons of competent legal knowledge and scientific ability, whose duty it shall be, on the written petition of the appellant, to revise and determine upon the validity of the adverse decisions of examiners upon applications for patents, and for reissues of patents, and in interference cases; and when required by the Commissioner, they shall hear and report upon claims for extensions, and perform such other like duties as he may assign them.

Sec. 483. The Commissioner of Patents, subject to the approval of the Secretary of the Interior, may from time to time establish regulations, not inconsistent with law, for the conduct of proceedings in the Patent Office.

Sec. 488. The Commissioner of Patents may require all papers filed in the Patent Office, if not correctly, legibly, and clearly written, to be printed at the cost of the party filing them.

Title XIII, Rev. Stat., p. 169:

Sec. 892. Written or printed copies of any records, books, papers, or drawings belonging to the Patent Office, and of letters patent authenticated by the seal and certified by the Commissioner or Acting Commissioner thereof, shall be evidence in all cases wherein the originals could be evidence; and any person making application therefor, and paying the

fee required by law, shall have certified copies thereof.

Sec. 893. Copies of the specifications and drawings of foreign letters patent certified as provided in the preceding section, shall be prima facie evidence of the fact of the granting of such letters patent, and of the date and contents thereof.

Sec. 894. The printed copies of specifications and drawings of patents, which the Commissioner of Patents is authorized to print for gratuitous distribution, and to deposit in the capitols of the States and Territories, and in the clerks' offices of the district court, shall, when certified by him and authenticated by the seal of his office, be received in all courts as evidence of all matters therein contained.

Sec. 973. When judgment or decree is rendered for the plaintiff or complainant, in any suit at law or in equity, for the infringement of a part of a patent, in which it appears that the patentee, in his specification, claimed to be the original and first inventor or discoverer of any material or substantial part of the thing patented, of which he was not the original and first inventor, no costs shall be recovered, unless the proper disclaimer, as provided by the patent laws, has been entered at the Patent Office before the suit was brought. (See Secs. 4917, 4922.)

Sec. 1537. No patented article connected with marine engines shall hereafter be purchased or used in connection with any steam vessels of war until the same shall have been submitted to a competent board of naval engineers, and recommended by such board, in writing, for purchase and use.

Title XVII, Rev. Stat., p. 292:

Sec. 1673. No royalty shall be paid by the United States to any one of its officers or employees for the use of any patent for the system, or any part thereof, nor for any such patent in which said officers or employees may be directly or indirectly interested.

Title LX, Rev. Stat., 1878, chap. 1, p. 945:

Sec. 4883. All patents shall be issued in the name of the United States of America, under the seal of the Patent Office, and shall be signed by the Commissioner of Patents, and they shall be recorded, together with the specifications, in the Patent Office in books to be kept for that purpose.

Sec. 4884. Every patent shall contain a short title or description of the invention or discovery, correctly indicating its nature and design, and a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories thereof, referring to the specification for the particulars thereof. A copy of the specification and drawings shall be annexed to the patent and be a part thereof.

Sec. 4885. Every patent shall issue within a period of three months from the date of the payment of the final fee, which fee shall be paid not later than six months from the time at which the application was passed and allowed and notice thereof was sent to the applicant or his agent; and if the final fee is not paid within that period the patent shall be withheld.

Sec. 4886. Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceeding had, obtain a patent therefor.

The Secretary of the Interior and the Commissioner of Patents are authorized to grant any officer of the Government, except officers and employees of the Patent Office, a patent for any invention of the classes mentioned in section 4886 of the Revised Statutes when such invention is used or to be used in the public service, without the payment of any fee; Provided, That the applicant in his application shall state that the invention described therein, if patented, may be used by the Government, or any of its officers or employees in prosecution of work for the Government, or by any other person in the United States, without the payment to him of any royalty thereon, which stipulation shall be included in the patent.

Sec. 4887. No person otherwise entitled thereto shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented by the inventor or his legal representatives or assigns in a foreign country, unless the application for said foreign patent was filed more than twelve months, in cases within the provisions of section 4886 of the Revised Statutes, and four months in cases of designs, prior to the filing of the application in this country, in which case no patent shall be granted in this country.

An application for patent for an invention or discovery or for a design filed in this country by any person who has previously regularly filed an application for a patent for the same invention, discovery, or design in a foreign country which, by treaty, convention, or law, affords similar privileges to citizens of the United States shall have the same force and effect as the same application would have if filed in this country on the date on which the application for patent for the same invention, discovery, or design was first filed in such foreign country, provided the application in this country is filed within twelve months in cases within the provisions of section 4886 of the Revised Statutes, and within four months in cases of designs, from the earliest date on which any such foreign application was filed. But no patent shall be granted on an application for patent for an invention or discovery or a design which had been patented or described in a printed publication in this or any foreign country more than two years before the date of the actual filing of the application in this country, or which had been in public use or on sale in this country for more than two years prion to such filing.

Sec. 4888. Before any inventor or discoverer shall receive a patent for his invention or discovery, he shall make application therefor, in writing, to the Commissioner of Patents, and shall file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it ap-

pertains, or with which it is most nearly connected, to make, construct, compound, and use the same; and in case of a machine, he shall explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions; and he shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim shall be signed by the inventor and attested by two witnesses.

Sec. 4889. When the nature of the case admits of drawings, the applicant shall furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, which shall be filed in the Patent Office; and a copy of the drawing, to be furnished by the Patent Office, shall be attached to the patent as a part of the specification.

Sec. 4890. When the invention or discovery is of a composition of matter, the applicant, if required by the Commissioner, shall furnish specimens of ingredients and of the composition, sufficient in quantity for the purpose of experiment.

Sec. 4891. In all cases which admit of representation by model, the applicant, if required by the Commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

Sec. 4892. The applicant shall make oath that he does verily believe himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe that the same was ever before known or used; and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public, judge, or magistrate having an official seal and authorized to administer oaths in the foreign country in which the applicant may be, whose authority shall be proved by certificate of a diplomatic or consular officer of the United States.

Sec. 4893. On the filing of any such application and the payment of the fees required by law, the Commissioner of Patents shall cause an examination to be made of the alleged new invention or discovery; and if on such examination it shall appear that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner shall issue a patent therefor.

Sec. 4894. All applications for patents shall be completed and prepared for examination within one year after the filing of the application, and in default thereof, or upon failure of the applicant to prosecute the same within one year after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner of Patents that such delay was unavoidable.

Sec. 4895. Patents may be granted and issued or reissued to the assignee of the inventor or discoverer; but the assignment must first be entered of record in the Patent Office. And in all cases of an application by an assignee for the issue of a patent, the application shall be made and the specification sworn to by the inventor or discoverer; and in all cases of an application for a reissue of any patent, the application must be made and the corrected specification signed by the inventor or discoverer, if he is living, unless the patent was issued and the assignment made before the eighth day of July, 1870.

Sec. 4896. When any person, having made any new invention or discovery for which a patent might have been granted, dies before a patent is granted, the right of applying for and obtaining the patent shall devolve on his executor or administrator, in trust for the heirs at law of the deceased, in case he shall have died intestate; or if he shall have left a will disposing of the same, then in trust for his devisees, in as full manner and on the same terms and conditions as the same might have been claimed or enjoyed by him in his lifetime; and when any person having made any new invention or discovery for which a patent might have been granted becomes insane before a patent is granted the right of applying for and obtaining the patent shall devolve on his legally appointed guardian, conservator, or representative in trust for his estate in as full manner and on the same terms and conditions as the same might have been claimed or enjoyed by him while sane and when the application is made by such legal representatives the oath or affirmation required to be made shall be so varied in form that it can be made by them. The executor or administrator duly authorized under the law of any foreign country to administer upon the estate of the deceased inventor shall, in case the said inventor was not domiciled in the United States at the time of his death, have the right to apply for and obtain the patent. The authority of such foreign executor or administrator shall be proved by certificate of a diplomatic or consular officer of the United States.

The foregoing section, as to insane persons, is to cover all applications now on file in the Patent Office or which may be hereafter made.

Sec. 4897. Any person who has an interest in an invention or discovery, whether as inventor, discoverer or assignee, for which a patent was ordered to issue upon the payment of the final fee, but who fails to make payment thereof within six months from the time at which it was passed and allowed, and notice thereof was sent to the applicant or his agent, shall have a right to make an application for a patent for such invention or discovery the same as in the case of an original application. But such second application must be made within two years after the allowance of the original application. But no person shall be held responsible in damages for the manufacture or use of any article or thing for which a patent was ordered to issue under such renewed application prior to the issue of the patent. And upon the hearing of renewed applications preferred under this section, abandonment shall be considered as a question of fact.

Sec. 4898. Every patent or any interest therein shall be assignable in law by an instrument in writing, and the patentee or his assigns or legal representatives may in like manner grant and convey an exclusive right under his patent to the whole or any specified part of the United States. An assignment, grant, or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless

it is recorded in the Patent Office within three months from the date thereof.

If any such assignment, grant, or conveyance of any patent shall be acknowledged before any notary public of the several States or Territories or the District of Columbia, or any commissioner of the United States Circuit Court, or before any secretary of legation or consular officer authorized to administer oaths or perform notarial acts under section 1750 of the Revised Statutes, the certificate of such acknowledgment, under the hand and official seal of such notary or other officer, shall be prima facie evidence of the execution of such assignment, grant or conveyance.

Sec. 4899. Every person who purchases of the inventor or discoverer, or, with his knowledge and consent, constructs any newly invented or discovered machine, or other patentable article, prior to the application by the inventor or discoverer for a patent, or who sells or uses one so constructed, shall have the right to use, and vend to others to be used, the specific thing so made or purchased, without liability therefor.

Sec. 4900. It shall be the duty of all patentees, and their assigns and legal representatives, and of all persons making or vending any patented article for or under them, to give sufficient notice to the public that the same is patented either by fixing thereon the word "patented," together with the day and year the patent was granted; or when, from the character of the article, this cannot be done, by fixing to it, or to the package wherein one or more of them is inclosed, a label containing the like notice; and in any suit for infringement, by the party failing so to mark, no damages shall be recovered by the plaintiff, except on proof that the defendant was duly notified of the infringement, and continued, after such notice, to make, use, or vend the article so patented.

Sec. 4901. Every person who, in any manner, marks upon anything made, used, or sold by him for which he has not obtained a patent, the name or any imitation of the name of any person who has obtained a patent therefor, without the consent of such patentee, or his assigns or legal representatives; or

Who, in any manner, marks upon or affixes to any such patented article the word "patent" or "patentee," or the words "letters patent," or any word of like import, with intent to imitate or counterfeit the mark or device of the patentee, without having the license or consent of such patentee or his assigns or legal representatives; or

Who, in any manner, marks upon or affixes to any unpatented article the word "patent" or any word importing that the same is patented, for the purpose of deceiving the public, shall be liable, for every such offense, to a penalty of not less than one hundred dollars, with costs; one-half of said penalty to the person who shall sue for the same, and the other to the use of the United States, to be recovered by suit in any district court of the United States within whose jurisdiction such offense may have been committed.

Sec. 4903. Whenever, on examination, any claim for a patent is rejected, the Commissioner shall notify the applicant thereof, giving him briefly the reasons for such rejection, together with such information and references as may be useful in judging of the propriety of renewing his application or of altering his specification; and if, after receiving such notice, the applicant persists in his claim for a patent, with or without altering his specifications, the Commissioner shall order a re-examination of the case.

Sec. 4904. Whenever an application is made for a patent which, in the opinion of the Commissioner, would interfere with any pending application, or with any unexpired patent, he shall give notice thereof to the applicants, or applicant and patentee, as the case may be, and shall direct the primary examiner to proceed to determine the question of priority of invention. And the Commissioner may issue a patent to the party who is adjudged the prior inventor, unless the adverse party appeals from the decision of the primary examiner, or of the board of examiners-in-chief, as the case may be, within such time, not less than twenty days, as the Commissioner shall prescribe.

Sec. 4905. The Commissioner of Patents may establish rules for taking affidavits and depositions required in cases pending in the Patent Office, and such affidavits and depositions may be taken before any officer authorized by law to take depositions to be used in the courts of the United States or of the State where the officer resides.

Sec. 4906. The clerk of any court of the United States, for any district or Territory wherein testimony is to be taken for use in any contested case pending in the Patent Office, shall, upon the application of any party thereto, or of his agent or attorney, issue a subpoena for any witness residing or being within such district or Territory, commanding him to appear and testify before any officer in such district or Territory authorized to take depositions and affidavits, at any time and place in the subpoena stated. But no witness shall be required to attend at any place more than forty miles from the place where the subpoena is served upon him.

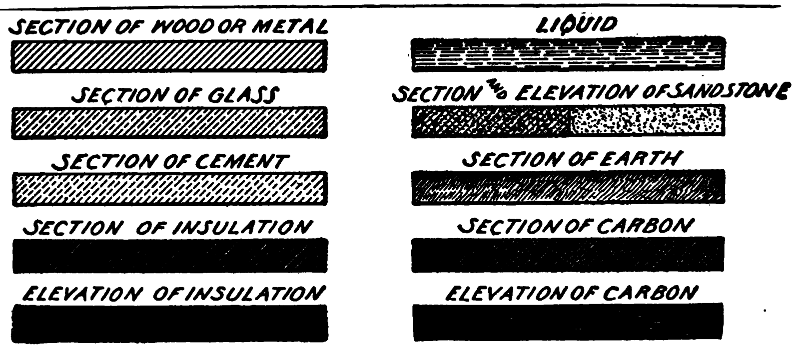
Sec. 4907. Every witness duly subpoenaed and in attendance shall be allowed the same fees as are allowed to witnesses attending the courts of the United States.

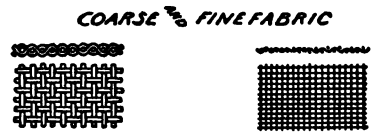
Sec. 4908. Whenever any witness, after being duly served with such subpoena, neglects or refuses to appear, or after appearing refuses to testify, the judge of the court whose clerk issued the subpoena may, on proof of such neglect or refusal, enforce obedience to the process, or punish the disobedience, as in other like cases. But no witness shall be deemed guilty of contempt for disobeying such subpoena, unless his fees and traveling expenses in going to, returning from, and one day's attendance at the place of examination, are paid or tendered him at the time of the service of the subpoena; nor for refusing to disclose any secret invention or discovery made or owned by himself.

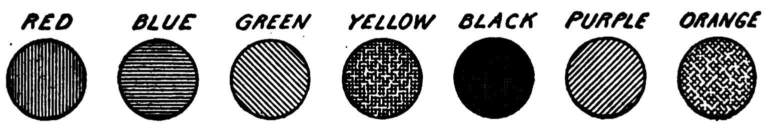
Sec. 4909. Every applicant for a patent or for the reissue of a patent, any of the claims of which have been twice rejected, and every party to an interference, may appeal from the decision of the primary examiner, or of the examiner in charge of interferences in such case, to the board of examiners-in-chief; having once paid the fee for such appeal.

Sec. 4910. If such party is dissatisfied with the decision of the examiners-in-chief, he may, on payment of the fee prescribed, appeal to the Commissioner in person.

Sec. 4911. If such party, except a party to an interference, is dissatisfied with the decision of the Commissioner, he may appeal to the Supreme Court of the District of Columbia, sitting in banc.







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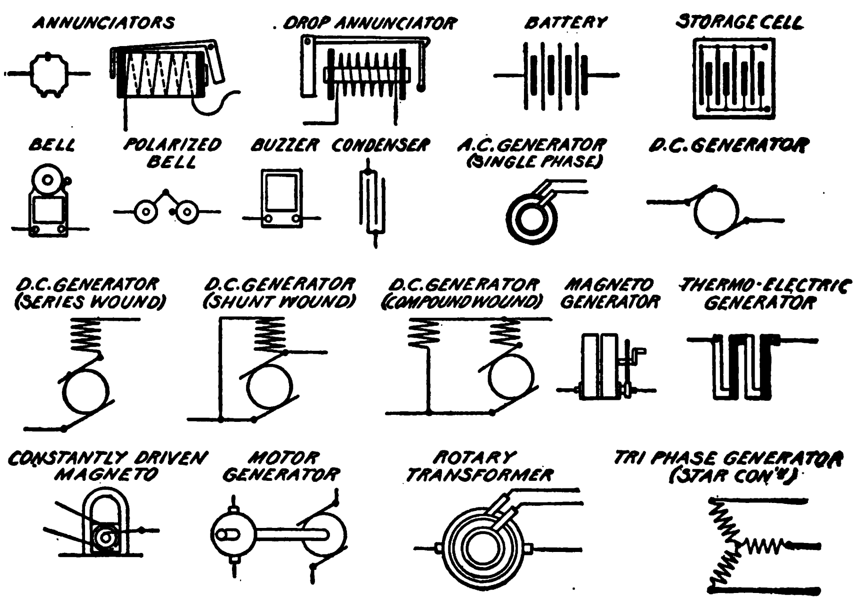

Sec. 4912. When an appeal is taken to the Supreme Court of the District of Columbia, the appellant shall give notice thereof to the Commissioner, and file in the Patent Office within such time as the Commissioner shall appoint, his reasons of appeal, specifically set forth in writing.

Sec. 4913. The court shall, before hearing such appeal, give notice to the Commissioner of the time and place of the hearing, and on receiving such notice the Commissioner shall give notice of such time and place in such manner as the court may prescribe, to all parties who appear to be interested therein. The party appealing shall lay before the court certified copies of all the original papers and evidence in the case, and the Commissioner shall furnish the court with the grounds of his decision, fully set forth in writing, touching all the points involved by the reasons of appeal. And at the request of any party interested, or of the court, the Commissioner and the examiners may be examined under oath, in explanation of the principles of the thing for which a patent is demanded

Sec. 4914. The court, on petition, shall hear and determine such appeal, and revise the decision appealed from in a summary way, on the evidence produced before the Commissioner, at such early and convenient time as the court may appoint; and the revision shall be confined to the points set forth in the reasons of appeal. After hearing the case the court shall return to the Commissioner a certificate of its proceedings and decision, which shall be entered of record in the Patent Office, and shall govern the further proceedings in the case. But no opinion or decision of the court in any such case shall preclude any person interested from the right to contest the validity of such patent in any court wherein the same may be called in question.

Sec. 4915. Whenever a patent on application is refused, either by the Commissioner of Patents or by the Supreme Court of the District of Columbia upon appeal from the Commissioner, the applicant may have remedy by bill in equity; and the court having cognizance thereof, on notice to adverse parties and other due proceedings had, may adjudge that such applicant is entitled, according to law, to receive a patent for his invention, as specified in his claim, or for any part thereof, as the facts in the case may appear. And such adjudication, if it be in favor of the right of the applicant, shall authorize the Commissioner to issue such patent on the applicant filing in the Patent Office a copy of the adjudication, and otherwise complying with the requirements of law. In all cases where there is no opposing party, a copy of the bill shall be served on the Commissioner; and all the expenses of the proceeding shall be paid by the applicant, whether the final decision is in his favor or not.

R. S., U. S., Sup., Vol. 2, c. 74, Feb. 9, 1893. Be it enacted, etc., That there shall be, and there is hereby, established in the District of Columbia a court, to be known as the court of appeals of the District of Columbia.

Sec. 6. That the said court of appeals shall establish a term of the court during each and every month in each year excepting the months of July and August.

Sec. 8. That any final judgment or decree of the said court of appeals may be re-examined and affirmed, reversed, or modified by the Supreme Court of the United States, upon writ of error or appeal, in all causes in which the matter in dispute, exclusive of costs, shall exceed the sum of five thousand dollars, in the same manner and under the same regulations as heretofore provided for in cases of writs of error on judgment or appeals from decrees rendered in the supreme court of the District of Columbia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in any case heretofore made final in the court of appeals of the District of Columbia, it shall be competent for the Supreme Court to require, by certiorari or otherwise, any such case to be certified to the Supreme Court for its review and determination, with the same power and authority in the case as if it had been carried by appeal or writ of error to the Supreme Court.

Sec. 9. That the determination of appeals from the decision of the Commissioner of Patents, now vested in the general term of the supreme court of the District of Columbia, in pursuance of the provisions of section 780 of the Revised Statutes of the United States, relating to the District of Columbia, shall hereafter be and the same is hereby vested in the court of appeals created by this act;

And in addition, any party aggrieved by a decision of the Commissioner of Patents in any interference case may appeal therefrom to said court of appeals.

Title LX, Rev. Stat., 1878, p. 950:

Sec. 4916. Whenever any patent is inoperative or invalid, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new, if the error has arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, the Commissioner shall, on the surrender of such patent and the payment of the duty required by law, cause a new patent for the same invention, and in accordance with the corrected specification, to be issued to the patentee, or, in case of his death or of an assignment of the whole or any undivided part of the original patent, then to his executors, administrators, or assigns, for the unexpired part of the term of the original patent. Such surrender shall take effect upon the issue of the amended patent. The Commissioner may, in his discretion, cause several patents to be issued for distinct and separate parts of the thing patented, upon demand of the applicant, and upon payment of the required fee for a reissue for each of such reissued letters patent. The specifications and claim in every such case shall be subject to revision and restriction in the same manner as original applications are. Every patent so reissued, together with the corrected specifications, shall have the same effect and operation in law, on the trial of all actions for causes thereafter arising, as if the same had been originally filed in such corrected form; but no new matter shall be introduced into the specification, nor in case of a machine patent shall the model or drawings be amended, except each by the other; but when there is neither model nor drawing, amendments may be made upon proof satisfactory to the Commissioner that such new matter or amendment was a part of the original invention, and was omitted from the specification by inadvertence, accident, or mistake, as aforesaid.

Sec. 4917. Whenever, through inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, a patentee has

claimed more than that of which he was the original or first inventor or discoverer, his patent shall be valid for all that part which is truly and justly his own, provided the same is a material or substantial part of the thing patented; and any such patentee, his heirs or assigns, whether of the whole or any sectional interest therein, may, on payment of the fee required by law, make disclaimer of such parts of the thing patented as he shall not chose to claim or to hold by virtue of the patent or assignment, stating therein the extent of his interest in such patent. Such disclaimer shall be in writing, attested by one or more witnesses, and recorded in the patent office; and it shall thereafter be considered as part of the original specification to the extent of the interest possessed by the claimant and by those claiming under him after the record thereof. But no such disclaimer shall affect any action pending at the time of its being filed, except so far as may relate to the question of unreasonable neglect or delay in filing it.

Sec. 4918. Whenever there are interfering patents, any person interested in any one of them, or in the working of the invention claimed under either of them, may have relief against the interfering patentee, and all parties interested under him, by suit in equity against the owners of the interfering patent; and the court, on notice to adverse parties, and other due proceedings had according to the course of equity, may adjudge and declare either of the patents void in whole or in part, or inoperative or invalid in any particular part of the United States, according to the interest of the parties in the patent or the invention patented. But no such judgment or adjudication shall affect the right of any person except the parties to the suit and those deriving title under them subsequent to the rendition of such judgment.

Sec. 4919. Damages for the infringement of any patent may be recovered by action on the case, in the name of the party interested either as patentee, assignee, or grantee. And whenever in any such action a verdict is rendered for the plaintiff, the court may enter judgment thereon for any sum above the amount found by the verdict as the actual damages sustained, according to the circumstances of the case, not exceeding three times the amount of such verdict, together with the costs.

Sec. 4920. In any action for infringement the defendant may plead the general issue, and, having given notice in writing to the plaintiff or his attorney thirty days before, may prove on trial any one or more of the following special matters:

First.—That for the purpose of deceiving the public the description and specification filed by the patentee in the Patent Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; or,

Second.—That he had surreptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or,

Third.—That it has been patented or described in some printed publication prior to his supposed invention or discovery thereof, or more than two years prior to his application for a patent therefor; or,

Fourth.—That he was not the original and first inventor or discoverer of any material and substantial part of the thing patented; or,

Fifth.—That it had been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public.

And in notices as to proof of previous invention, knowledge, or use of the thing patented, the defendant shall state the names of the patentees and the dates of their patents, and when granted, and the names and residences of the persons alleged to have invented or to have had the prior knowledge of the thing patented, and where and by whom it had been used; and if any one or more of the special matters alleged shall be found for the defendant, judgment shall be rendered for him with costs. And the like defenses may be pleaded in any suit in equity for relief against an alleged infringement; and proofs of the same may be given upon like notice in the answer of the defendant, and with the like effect.

Sec. 4921. The several courts vested with jurisdiction of cases arising under the patent laws shall have power to grant injunctions according to the course and principles of courts of equity, to prevent the violation of any right secured by patent, on such terms as the court may deem reasonable; and upon a decree being rendered in any such case for an infringement the complainant shall be entitled to recover, in addition to the profits to be accounted for by the defendant, the damages the complainant has sustained thereby; and the court shall assess the same or cause the same to be assessed under its direction. And the court shall have the same power to increase such damages, in its discretion, as is given to increase the damages found by verdicts in actions in the nature of actions of trespass upon the case.

But in any suit or action brought for the infringement of any patent there shall be no recovery of profits or damages for any infringement committed more than six years before the filing of the bill of complaint or the issuing of the writ in such suit or action, and this provision shall apply to existing causes of action.

Sec. 2. That said courts, when sitting in equity for the trial of patent causes, may impanel a jury of not less than five and not more than twelve persons, subject to such general rules in the premises as may, from time to time, be made by the Supreme Court, and submit to them such questions of fact arising in such cause as such circuit court shall deem expedient.

And the verdict of such jury shall be treated and proceeded upon in the same manner and with the same effect as in the case of issues sent from chancery to a court of law and returned with such findings.

Sec. 4922. Whenever, through inadvertence, accident, or mistake, and without any wilful default or intent to defraud or mislead the public, a patentee has, in his specification, claimed to be the original and first inventor or discoverer of any material or substantial part of the thing patented, of which he was not the original and first inventor or discoverer, every such patentee, his executors, administrators, and assigns, whether of the whole or any sectional interest in the patent, may maintain a suit at law or in equity, for the infringement of any part thereof, which was bona fide his own, if it is a material and substantial part of the thing patented, and definitely distinguishable from the parts claimed without right, not-

withstanding the specifications may embrace more than that of which the patentee was the first inventor or discoverer. But in every such case in which a judgment or decree shall be rendered for the plaintiff, no costs shall be recovered unless the proper disclaimer has been entered at the Patent Office before the commencement of the suit But no patentee shall be entitled to the benefits of this section if he has unreasonably neglected or delayed to enter a disclaimer.

Sec. 4923. Whenever it appears that a patentee, at the time of making his application for the patent, believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery or any part thereof having been known or used in a foreign country, before his invention or discovery thereof, if it had not been patented or described in a printed publication.

DESIGNS.

Sec. 4929. Any person who has invented any new, original, and ornamental design for an article of manufacture, not known or used by others in this country before his invention thereof, and not patented or described in any printed publication in this or any foreign country before his invention thereof, or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law and other due proceedings had, the same as in cases of invention or discoveries covered by section 4886, obtain a patent therefor.

Sec. 4930. The Commissioner may dispense with models of designs when the design can be sufficiently represented by drawings or photographs.

Sec 4931. Patents for designs may be granted for the term of three years and six months, or for seven years, or for fourteen years, as the applicant may, in his application, elect.

Sec. 4932. Patentees of designs issued prior to the second day of March, 1861, shall be entitled to extension of their respective patents for the term of seven years, in the same manner and under the same restrictions as are provided for the extension of patents for inventions or discoveries issued prior to the second day of March, 1861.

Sec. 4933. All the regulations and provisions which apply to obtaining or protecting patents for inventions or discoveries not inconsistent with the provisions of this Title, shall apply to patents for designs.

CHAPTER 105.—An Act to Amend the Law Relating to Patents, Trade-marks, and Copyrights.

Be it enacted, etc., That hereafter during the term of letters patent for a design, it shall be unlawful for any person other than the owner of said letters patent, without the license of such owner to apply the design secured by such letters patent, or any colorable imitation thereof, to any article of manufacture for the purpose of sale, or to sell or expose for sale any article of manufacture to which such design or colorable imitation shall, without the license of the owner, have been applied, knowing that the same has been so applied. Any person violating the provisions, or either of them, of this section, shall be liable in the amount of two hundred and fifty dollars; and in case the total profit made by him from the manufacture or sale, as aforesaid, of the article or articles to which the design, or colorable imitation thereof, has been applied, exceeds the sum of two hundred and fifty dollars, he shall be further liable for the excess of such profit over and above the sum of two hundred and fifty dollars; and the full amount of such liability may be recovered by the owner of the letters patent, to his own use, in any circuit court of the United States having jurisdiction of the parties, either by action at law or upon a bill in equity for an injunction to restrain such infringement.

Sec. 2. That nothing in this act contained shall prevent, lessen, impeach, or avoid any remedy at law or in equity which any owner of letters patent for a design, aggrieved by the infringement of the same, might have had if this act had not been passed; but such owner shall not twice recover the profit made from the infringement

Sec. 4934. The following shall be the rates for patent fees:

On filing each original application for a patent, except in design cases, fifteen dollars.

On issuing each original patent, except in design cases, twenty dollars.

In design cases: For three years and six months, ten dollars; for seven years, fifteen dollars; for fourteen years, thirty dollars.

On every application for the reissue of a patent, thirty dollars.

On filing each disclaimer, ten dollars.

* * * * * * *

On an appeal for the first time from the primary examiners to the examiners-in-chief, ten dollars.

On every appeal from the examiners-in-chief to the Commissioner, twenty dollars.

For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words.

For recording every assignment, power of attorney, or other paper, of three hundred words or under, one dollar; of over three hundred and under one thousand words, two dollars; and for each additional thousand words or fraction thereof, one dollar.

Certified copies of such drawings and specifications may be furnished by the Commissioner of Patents to persons applying therefor upon payment of the present rates for uncertified copies, and twenty-five cents additional for each certification.

For copies of drawings, the reasonable cost of making them.

PATENT RIGHTS VEST IN ASSIGNEE IN BANKRUPTCY.

Sec. 5046. All property conveyed by the bankrupt in fraud of his creditors; all rights in equity, choses in action, patent rights, and copyrights; all debts due him, or any person for his use, and all liens and securities therefor; and all his rights of action for property or estate, real or personal, and for any cause of action which he had against any person arising from contract or from the unlawful taking or detention, or injury to the property of the bankrupt; and all his rights of redeeming such property or estate; together with

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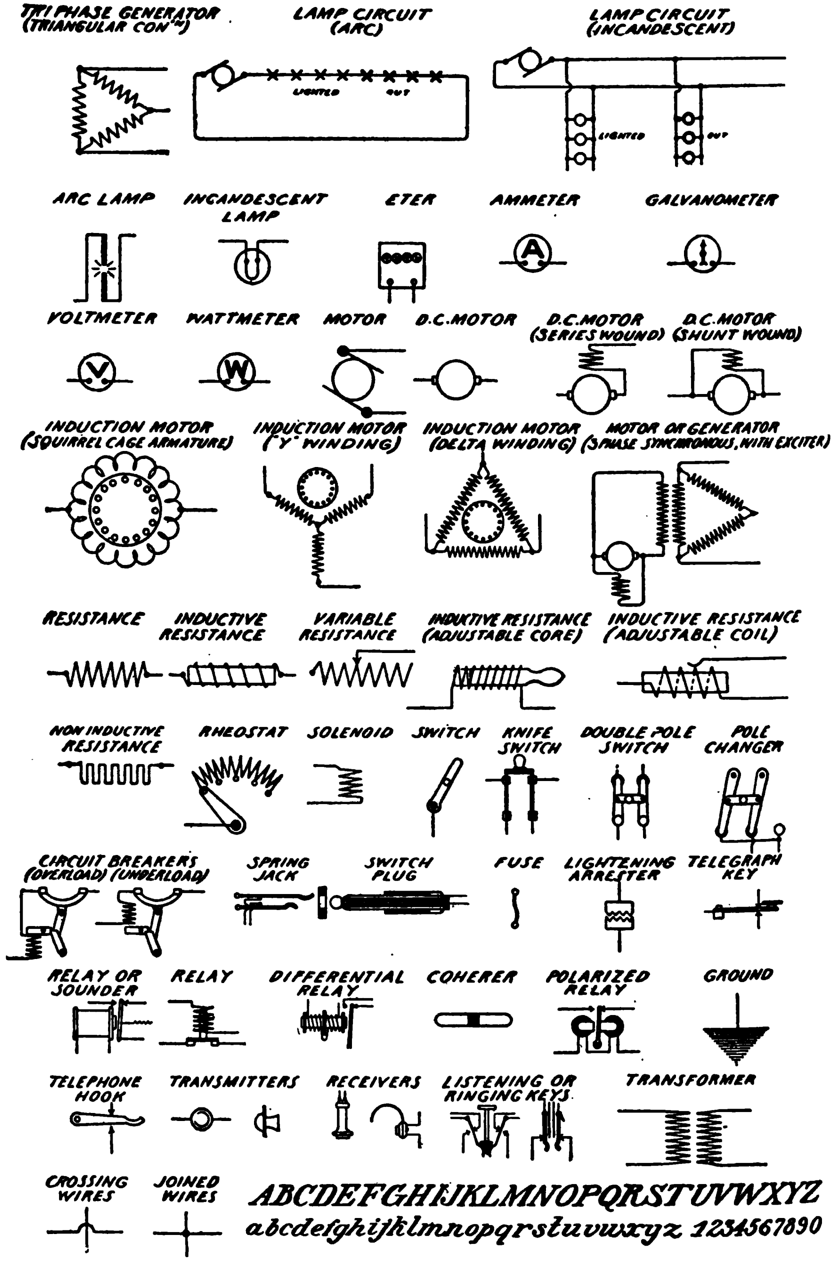

the like right, title, power, and authority to sell, manage, dispose of, sue for, and recover or defend the same, as the bankrupt might have had if no assignment had been made, shall, in virtue of the adjudication of bankruptcy and the appointment of his assignee, but subject to the exceptions stated in the preceding section, be at once vested is [in] such assignee.

Sec. 70. Title to Property. The trustee of the estate of a bankrupt, upon his appointment and qualification, and his successor or successors, if he shall have one or more, upon his or their appointment and qualification, shall in turn be vested by operation of law with the title of the bankrupt, as of the date he was adjudged a bankrupt, except in so far as it is to property which is exempt, to all (1) documents relating to his property; (2) interests in patents, patent rights, copyrights, and trade-marks.

PUBLIC—No. 305. June 25, 1910.

An act to provide additional protection for owners of patents of the United States and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever an invention described in and covered by a patent of the United States shall hereafter be used by the United States without license of the owner thereof or lawful right to use the same, such owner may recover reasonable compensation for such use by suit in the Court of Claims: Provided, however, that said Court of Claims shall not entertain a suit or reward compensation under the provisions of this Act where the claim for compensation is based on the use by the United States of any article heretofore owned, leased, used by or in the possession of the United States: Provided further, That in any such suit the United States may avail itself of any and all defenses, general or special, which might be pleaded by a defendant in an action for infringement, as set forth in Title Sixty of the Revised Statutes, or otherwise; And provided further, That the benefits of this Act shall not inure to any patentee, who, when he makes such claim, is in the employment or service of the Government of the United States; or the assignee of any such patentee; nor shall this act apply to any device discovered or invented by such employee during the time of his employment or service.

COURTS.

Public—No. 475. March 3, 1911

An Act to codify, revise and amend the laws relating to the judiciary.

Title—The Judiciary.

Sec. 24. The district courts shall have original jurisdiction as follows:

Seventh. Of all suits at law or in equity arising under the patent, the copyright, and the trade-mark laws.

Sec. 48. In suits brought for the infringement of letters patent, the district courts of the United States shall have jurisdiction, in law or in equity, in the district of which the defendant is an inhabitant, or in any district in which the defendant, whether a person, partnership, or corporation, shall have committed acts of infringement and have a regular and established place of business. If such suit is brought in a district of which the defendant is not an inhabitant, but in which such defendant has a regular and established place of business, service of process, summons, or subpoena upon the defendant may be made by service upon the agent or agents engaged in conducting such business in the district in which suit is brought.

Sec. 128. The circuit courts of appeals shall exercise appellate jurisdiction to review by appeal or writ or error final decisions in the district courts, * * * * * * in all cases other than those in which appeals and writs of error may be taken direct to the Supreme Court * * * * *; the judgments and decrees of the circuit courts of appeal shall be final * * * in all cases arising under the patents laws, under the copyright laws, * * *.

Sec. 239. In any case within its appellate jurisdiction, as defined in section one hundred and twenty-eight, the circuit court of appeals at any time may certify to the Supreme Court of the United States any questions or propositions of law concerning which it desires the instruction of that court for its proper decision; and thereupon the Supreme Court may either give its instruction on the questions and propositions certified to it, which shall be binding upon the circuit court of appeals in such case, or it may require that the whole record and cause be sent up to it for its consideration, and thereupon shall decide the whole matter in controversy in the same manner as if it had been brought there for review by writ of error or appeal.

Sec. 250. Any final judgment or decree of the court of appeals of the District of Columbia may be re-examined and affirmed, reversed, or modified by the Supreme Court of the United States upon writ of error or appeal, in the following cases:

* * * * * * * * * *

Except as provided in the next succeeding section, the judgments and decrees of said court of appeals shall be final in all cases arising under the patent laws, the copyright laws, * * *.

Sec. 251. In any case in which the judgment or decree of said court of appeals is made final by the section last preceding, it shall be competent for the Supreme Court of the United States to require, by certiorari or otherwise, any such case to be certified to it for its review and determination, with the same power and authority in the case as if it had been carried by writ of error or appeal to said Supreme Court. It shall also be competent for said court of appeals, in any case in which its judgment or decree is made final under the section last preceding, at any time to certify to the Supreme Court of the United States any questions or propositions of law concerning which it desires the instruction of that court for their proper decision; and thereupon the Supreme Court may either give its instruction on the questions and propositions certified to it, which shall be binding upon said court of appeals in such case, or it may require that the whole record and cause be sent up to it for its consideration, and thereupon shall decide the whole matter in controversy in the same manner as if it had been brought there for review by writ of error or appeal.

Sec. 256. The jurisdiction vested in the courts of the United States in the cases and proceedings hereinafter mentioned shall be exclusive of the courts of the several States.

Fifth. Of all cases arising under the patent-right, or copyright laws of the United States.

PRINTS AND LABELS.

Excerpts from an Act approved March 4, 1909, entitled an Act to amend and consolidate the Acts respecting copyright, relating to prints and labels.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person entitled thereto, upon complying with the provisions of this Act, shall have the exclusive right:

(a) To print, reprint, publish, copy, and vend the copyrighted work;

Sec. 7. That no copyright shall subsist in the original text of any work which is in the public domain, or in any work which was published in this country or any foreign country prior to the going into effect of this Act and has not been already copyrighted in the United States, or in any publication of the United States Government, or any reprint, in whole or in part, thereof: Provided, however, That the publication or republication by the Government, either separately or in a public document, of any material in which copyright is subsisting shall not be taken to cause any abridgment or annulment of the copyright or to authorize any use or appropriation of such copyright material without the consent of the copyright proprietor.

Sec. 8. That the author or proprietor of any work made the subject of copyright by this Act, or his executors, administrators, or assigns, shall have copyright for such work under the conditions and for the terms specified in this Act. Provided, however, That the copyright secured by this Act shall extend to the work of an author or proprietor who is a citizen or subject of a foreign state or nation, only:

(a) When an alien author or proprietor shall be domiciled within the United States at the time of the first publication of his work; or

(b) When the foreign state or nation of which such author or proprietor is a citizen or subject grants, either by treaty, convention, agreement, or law, to citizens of the United States the benefit of copyright on substantially the same basis as to its own citizens, or copyright protection substantially equal to the protection secured to such foreign author under this Act or by treaty; or when such foreign state or nation is a party to an international agreement which provides for reciprocity in the granting of copyright, by the terms of which agreement the United States may, at its pleasure, become a party thereto.

The existence of the reciprocal conditions aforesaid shall be determined by the President of the United States, by proclamation made from time to time, as the purposes of this Act may require.

Sec. 9. That any person entitled thereto by this Act may secure copyright for his work by publication thereof with the notice of copyright required by this Act; and such notice shall be affixed to each copy thereof published or offered for sale in the United States by authority of the copyright proprietor, except in the case of books seeking ad interim protection. * * *

Sec. 18. That the notice of copyright required by section nine of this Act shall consist either of the word "Copyright" or the abbreviation "Copr.", accompanied by the name of the copyright proprietor, and if the work be a printed literary, musical, or dramatic work, the notice shall include also the year in which the copyright was secured by publication. In the case, however, of copies of works specified in subsections (f) to (k), inclusive, of section five of this Act, the notice may consist of the letter C inclosed within a circle, accompanied by the initials, monogram, mark, or symbol of the copyright proprietor: Provided, That on some accessible portion of such copies or of the margin, back, permanent base, or pedestal, or of the substance on which such copies shall be mounted, his name shall appear. But in the case of works in which copyright is subsisting when this Act shall go into effect, the notice of copyright may be either in one of the forms prescribed herein or in one of those prescribed by the Act of June eighteenth, eighteen hundred and seventy-four.

Sec. 23. That the copyright secured by this Act shall endure for twenty-eight years from the date of first publication, whether the copyrighted work bears the author's true name or is published anonymously or under an assumed name: Provided, That in the case of any posthumous work or of any periodical, cyclopaedic, or other composite work upon which the copyright was originally secured by the proprietor thereof, or of any work copyrighted by a corporate body (otherwise than as assignee or licensee of the individual author) or by an employer for whom such work is made for hire, the proprietor of such copyright shall be entitled to a renewal and extension of the copyright in such work for the further term of twenty-eight years when application for such renewal and extension shall have been made to the copyright office and duly registered therein within one year prior to the expiration of the original term of copyright: And Provided further, That in the case of any other copyrighted work, including a contribution by an individual author to a periodical or to a cyclopaedic or other composite work when such contribution has been separately registered, the author of such work if still living, or the widow, widower, or children of the author, if the author be not living, or if such author, widow, widower, or children be not living, then the author's, executor's or in the absence of a will, his next of kin shall be entitled to a renewal and extension of the copyright in such work for a further term of twenty-eight years when application for such renewal and extension shall have been made to the copyright office and duly registered therein within one year prior to the expiration of the original term of copyright: And provided further, That in default of the registration of such application for renewal and extension, the copyright in any work shall determine at the expiration of twenty-eight years from first publication.

Sec. 24. That the copyright subsisting in any work at the time when this Act goes into effect may, at the expiration of the term provided for under existing law, be renewed and extended by the author of such work if still living, or the widow, widower, or children of the author, if the author be not living, or if such author, widow, widower, or children be not living, then by the author's executors, or in the absence of a will, his next of kin, for a further period such that the entire term shall be equal to that secured by this Act, including the renewal period: Provided, however, That if the work be a composite work upon which copyright

was originally secured by the proprietor thereof, then such proprietor shall be entitled to the privilege of renewal and extension granted under this section: Provided, That application for such renewal and extension shall be made to the copyright office and duly registered therein within one year prior to the expiration of the existing term.

Sec. 42. That copyright secured under this or previous Acts of the United States may be assigned, granted, or mortgaged by an instrument in writing signed by the proprietor of the copyright, or may be bequeathed by will.

Act approved June 18, 1874, relating to registration of prints and labels.

Sections 3, 4, and 5 of the act of Congress relating to patents, trade-marks, and copyrights, approved June 18, 1874 (18 Stat. L., p. 78) are as follows:

Sec 3. That in the construction of this act the words "engraving, cut, and print" shall be applied only to pictorial illustrations or works connected with the fine arts, and no prints or labels designed to be used for any other articles of manufacture shall be entered under the copyright law, but may be registered in the Patent Office. And the Commissioner of Patents is hereby charged with the supervision and control of the entry or registry of such prints or labels, in conformity with the regulations provided by law as to copyright of prints, except that there shall be paid for recording the title of any print or label, not a trade-mark, six dollars, which shall cover the expense of furnishing a copy of the record, under the seal of the Commissioner of Patents, to the party entering the same.

Sec. 4. That all laws and parts of laws inconsistent with the foregoing provisions be, and the same are hereby, repealed.

Sec. 5. That this act shall take effect on and after the first day of August, eighteen hundred and seventy-four.

TRADE-MARKS.

Act of February 20, 1905 (As Amended).

AN ACT To authorize the registration of trade-marks used in commerce with foreign nations or among the several States or with Indian tribes, and to protect the same.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the owner of a trade-mark used in commerce with foreign nations, or among the several States, or with Indian tribes, provided such owner shall be domiciled within the territory of the United States, or resides in or is located in any foreign country which, by treaty, convention, or law, affords similar privileges to the citizens of the United States, may obtain registration for such trade-mark by complying with the following requirements: First, by filing in the Patent Office an application therefor, in writing, addressed to the Commissioner of Patents, signed by the applicant, specifying his name, domicile, location, and citizenship; the class of merchandise and the particular description of goods comprised in such class to which the trade-mark is appropriated; a statement of the mode in which the same is applied and affixed to goods, and the length of time during which the trade-mark has been used; a description of the trade-mark itself shall be included, if desired by the applicant or required by the commissioner, provided such description is of a character to meet the approval of the commissioner. With this statement shall be filed a drawing of the trade-mark, signed by the applicant, or his attorney, and such number of specimens of the trade-mark as actually used as may be required by the Commissioner of Patents. Second, by paying into the Treasury of the United States the sum of ten dollars, and otherwise complying with the requirements of this act and such regulations as may be prescribed by the Commissioner of Patents.

Sec. 2 That the application prescribed in the foregoing section, in order to create any right whatever in favor of the party filing it, must be accompanied by a written declaration verified by the applicant, or by a member of the firm or an officer of the corporation or association applying, to the effect that the applicant believes himself or the firm, corporation, or association in whose behalf he makes the application to be the owner of the trade-mark sought to be registered, and that no other person, firm, corporation, or association, to the best of the applicant's knowledge and belief, has the right to use such trade-mark in the United States, either in the identical form or in such near resemblance thereto as might be calculated to deceive; that such trade-mark is used in commerce among the several States, or with foreign nations, or with Indian tribes, and that the description and drawing, presented truly represent the trade-mark sought to be registered. If the applicant resides or is located in a foreign country, the statement required shall, in addition to the foregoing, set forth that the trade-mark has been registered by the applicant, or that an application for the registration thereof has been filed by him in the foreign country in which he resides or is located, and shall give the date of such registration, or the application therefor, as the case may be, except that in the application in such cases it shall not be necessary to state that the mark has been used in commerce with the United States or among the States thereof. The verification required by this section may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public, judge, or magistrate having an official seal and authorized to administer oaths in the foreign country in which the applicant may be whose authority shall be proved by a certificate of a diplomatic or consular officer of the United States.

Sec. 3. That every applicant for registration of a trade-mark, or for renewal of registration of a trade-mark, who is not domiciled within the United States, shall, before the issuance of the certificate of registration, as hereinafter provided for, designate, by a notice in writing, filed in the Patent Office, some person residing within the United States on whom process or notice of proceedings affecting the right of ownership of the trade-mark of which such applicant may claim to be the owner, brought under the provisions of this act or under other laws of the United

States, may be served, with the same force and effect as if served upon the applicant or registrant in person. For the purposes of this act it shall be deemed sufficient to serve such notice upon such applicant, registrant, or representative by leaving a copy of such process or notice addressed to him at the last address of which the Commissioner of Patents has been notified.

Sec. 4. That an application for registration of a trade-mark filed in this country by any person who has previously regularly filed in any foreign country which, by treaty, convention, or law, affords similar privileges to citizens of the United States an application for registration of the same trade-mark shall be accorded the same force and effect as would be accorded to the same application if filed in this country on the date on which application for registration of the same trade-mark was first filed in such foreign country: Provided, That such application is filed in this country within four months from the date on which the application was first filed in such foreign country: And provided, That certificate of registration shall not be issued for any mark for registration of which application has been filed by an applicant located in a foreign country until such mark has been actually registered by the applicant in the country in which he is located.

Sec. 5. That no mark by which the goods of the owner of the mark may be distinguished from other goods of the same class shall be refused registration as a trade-mark on account of the nature of such mark unless such mark—

(a) Consists of or comprises immoral or scandalous matter.

(b) Consists of or comprises the flag or coat of arms or other insignia of the United States, or any simulation thereof, or of any State, or municipality, or of any foreign nation, or of any design or picture that has been or may hereafter be adopted by any fraternal society as its emblem: Provided, That trade-marks which are identical with a registered or known trade-mark owned and in use by another, and appropriated to merchandise of the same descriptive properties, or which so nearly resemble a registered or known trade-mark owned and in use by another and appropriated to merchandise of the same descriptive properties, as to be likely to cause confusion or mistake in the mind of the public, or to deceive purchasers, shall not be registered: Provided, That no mark which consists merely in the name of an individual, firm, corporation, or association not written, printed, impressed, or woven in some particular or distinctive manner or in association with a portrait of the individual or merely in words or devices which are descriptive of the goods with which they are used, or of the character or quality of such goods, or merely a geographical name or term, shall be registered under the terms of the act: Provided further, That no portrait of a living individual may be registered as a trade-mark, except by the consent of such individual, evidenced by an instrument in writing: And provided further, That nothing herein shall prevent the registration of any mark used by the applicant or his predecessors, or by those from whom title to the mark is derived, in commerce with foreign nations or among the several States, or with Indian tribes, which was in actual and exclusive use as a trade-mark of the applicant or his predecessors from whom he derived title for ten years next preceding February twentieth, nineteen hundred and five: Provided further, That nothing herein shall prevent the registration of a trade-mark otherwise registrable because of its being the name of the applicant or a portion thereof.

Sec. 6. That on the filing of an application for registration of a trade-mark which complies with the requirements of this act, and the payment of the fees herein provided for, the Commissioner of Patents shall cause an examination thereof to be made, and if on such examination it shall appear that the applicant is entitled to have his trade-mark registered under the provisions of this act, the commissioner shall cause the mark to be published at least once in the Official Gazette of the Patent Office. Any person who believes he would be damaged by the registration of a mark may oppose the same by filing notice of opposition, stating the grounds therefor, in the Patent Office within thirty days after the publication of the mark sought to be registered, which said notice of opposition shall be verified by the person filing the same before one of the officers mentioned in section two of this act. An opposition may be filed by a duly authorized attorney, but such opposition shall be null and void unless verified by the opposer within a reasonable time after such filing. If no notice of opposition is filed within said time, the commissioner shall issue a certificate of registration therefor, as hereinafter provided for. If on examination an application is refused, the commissioner shall notify the applicant, giving him his reasons therefor.

Sec. 7. That in all cases where notice of opposition has been filed the Commissioner of Patents shall notify the applicant thereof and the grounds therefor.

Whenever application is made for the registration of a trade-mark which is substantially identical with a trade-mark appropriated to goods of the same descriptive properties, for which a certificate of registration has been previously issued to another, or for registration of which another has previously made application, or which so nearly resembles such trade-mark, or a known trade-mark owned and used by another, as, in the opinion of the commissioner, to be likely to be mistaken therefor by the public, he may declare that an interference exists as to such trade-mark, and in every case of interference or opposition to registration he shall direct the examiner in charge of interferences to determine the question of the right of registration to such trade-mark, and of the sufficiency of objections to registration, in such manner and upon such notice to those interested as the commissioner may by rules prescribe.

The commissioner may refuse to register the mark against the registration of which objection is filed, or may refuse to register both of two interfering marks, or may register the mark, as a trade-mark, for the person first to adopt and use the mark, if otherwise entitled to register the same, unless an appeal is taken, as hereinafter provided for, from his decision, by a party interested in the proceeding, within such time (not less than twenty days) as the commissioner may prescribe.

Sec. 8. That every applicant for the registration of a trade-mark, or for the renewal of the registration of a trade-mark, which application is refused, or a party to an interference against whom a decision has been rendered, or a party who has filed a notice of opposition as to a trade-mark, may appeal from the decision of the examiner in charge

of trade-marks, or the examiner in charge of interferences, as the case may be, to the commissioner in person, having once paid the fee for such appeal.

Sec. 9. That if an applicant for registration of a trade-mark, or a party to an interference as to a trade-mark, or a party who has filed opposition to the registration of a trade-mark, or party to an application for the cancellation of the registration of a trade-mark, is dissatisfied with the decision of the Commissioner of Patents, he may appeal to the court of appeals of the District of Columbia, on complying with the conditions required in case of an appeal from the decision of the commissioner by an applicant for patent, or a party to an interference as to an invention, and the same rules of practice and procedure shall govern in every stage of such proceedings, as far as the same may be applicable.

Sec. 10. That every registered trade-mark, and every mark for the registration of which application has been made, together with the application for registration of the same, shall be assignable in connection with the good will of the business in which the mark is used. Such assignment must be by an instrument in writing and duly acknowledged according to the laws of the country or State in which the same is executed; any such assignment shall be void as against any subsequent purchaser for a valuable consideration, without notice, unless it is recorded in the Patent Office within three months from date thereof. The commissioner shall keep a record of such assignments.

Sec. 11. That certificates of registration of trade-marks shall be issued in the name of the United States of America, under the seal of the Patent Office, and shall be signed by the Commissioner of Patents, and a record thereof, together with printed copies of the drawing and statement of the applicant, shall be kept in books for that purpose. The certificate shall state the date on which the application for registration was received in the Patent Office. Certificates of registration of trade-marks may be issued to the assignee of the applicant, but the assignment must first be entered of record in the Patent Office.

Written or printed copies of any records, books, papers, or drawings relating to trade-marks belonging to the Patent Office, and of certificates of registration, authenticated by the seal of the Patent Office and certified by the commissioner thereof, shall be evidence in all cases wherein the originals could be evidence; and any person making application therefor and paying the fee required by law shall have certified copies thereof.

Sec. 12.—That a certificate of registration shall remain in force for twenty years, except that in the case of trade-marks previously registered in a foreign country such certificate shall cease to be in force on the day on which the trade-mark ceases to be protected in such foreign country, and shall in no case remain in force more than twenty years, unless renewed. Certificates of registration may be from time to time renewed for like periods on payment of the renewal fees required by this act, upon request by the registrant, his legal representatives, or transferees of record in the Patent Office, and such request may be made at any time not more than six months prior to the expiration of the period for which the certificates of registration were issued or renewed. Certificates of registration in force at the date at which this act takes effect shall remain in force for the period for which they were issued, but shall be renewable on the same conditions and for the same periods as certificates issued under the provisions of this act, and when so renewed shall have the same force and effect as certificates issued under this act.

Sec. 13. That whenever any person shall deem himself injured by the registration of a trade-mark in the Patent Office he may at any time apply to the Commissioner of Patents to cancel the registration thereof. The commissioner shall refer such application to the examiner in charge of interferences, who is empowered to hear and determine this question and who shall give notice thereof to the registrant. If it appear after a hearing before the examiner that the registrant was not entitled to the use of the mark at the date of his application for registration thereof, or that the mark is not used by the registrant, or has been abandoned, and the examiner shall so decide, the commissioner shall cancel the registration. Appeal may be taken to the commissioner in person from the decision of examiner of interferences.

Sec. 14. That the following shall be the rates for trade-mark fees:

On filing each original application for registration of a trade-mark, ten dollars: Provided, That an application for registration of a trade-mark pending at the date of the passage of this act, and on which certificate of registration shall not have issued at such date, may, at the option of the applicant, be proceeded with and registered under the provisions of this act without the payment of further fee.

On filing each application for renewal of the registration of a trade-mark, ten dollars.

On filing notice of opposition to the registration of a trade-mark, ten dollars.

On an appeal from the examiner in charge of trade-marks to the Commissioner of Patents, fifteen dollars.

On an appeal from the decision of the examiner in charge of interferences, awarding ownership of a trade-mark or canceling the registration of a trade-mark, to the Commissioner of Patents, fifteen dollars

For certified and uncertified copies of certificates of registration and other papers, and for recording transfers and other papers, the same fees as required by law for such copies of patents and for recording assignments and other papers relating to patents.

Sec. 15. That sections forty-nine hundred and thirty-five and forty-nine hundred and thirty-six of the Revised Statutes, relating to the payment of patent fees and to the repayment of fees paid by mistake, are hereby made applicable to trade-mark fees.

Sec. 16. That the registration of a trade-mark under the provisions of this act shall be prima facie evidence of ownership. Any person who shall, without the consent of the owner thereof, reproduce, counterfeit, copy, or colorably imitate any such trade-mark and affix the same to merchandise of substantially the same descriptive properties as those set forth in the registration, or to labels, signs, prints, packages, wrappers or receptacles intended to be used upon or in connection with the sale of merchandise of substantially the same descriptive properties as those set forth in such registration, and shall use, or shall have used, such reproduction, counterfeit, copy, or colorable imitation in commerce among the several States, or with a foreign nation, or with the Indian tribes, shall be liable to an action for damages therefor at the suit of the owner thereof; and whenever in any such action a

verdict is rendered for the plaintiff, the court may enter judgment therein for any sum above the amount found by the verdict as the actual damages, according to the circumstances of the case, not exceeding three times the amount of such verdict, together with the costs.

Sec. 17. That the circuit and territorial courts of the United States and the supreme court of the District of Columbia shall have original jurisdiction, and the circuit courts of appeal of the United States and the court of appeals of the District of Columbia shall have appellate jurisdiction of all suits at law or in equity respecting trade-marks registered in accordance with the provisions of this act, arising under the present act, without regard to the amount in controversy.

Sec. 18. That writs of certiorari may be granted by the Supreme Court of the United States for the review of cases arising under this act in the same manner as provided for patent cases by the act creating the circuit court of appeals.

Sec. 19. That the several courts vested with jurisdiction of cases arising under the present act shall have power to grant injunctions, according to the course and principles of equity, to prevent the violation of any right of the owner of a trade-mark registered under this act, on such terms as the court may deem reasonable; and upon a decree being rendered in any such case for wrongful use of a trade-mark the complainant shall be entitled to recover, in addition to the profits to be accounted for by the defendant, the damages the complainant has sustained thereby, and the court shall assess the same or cause the same to be assessed under its direction. The court shall have the same power to increase such damages, in its discretion, as is given by section sixteen of this act for increasing damages found by verdict in actions of law; and in assessing profits the plaintiff shall be required to prove defendant's sales only; defendant must prove all elements of cost which are claimed.

Sec. 20. That in any case involving the right to a trade-mark registered in accordance with the provisions of this act, in which the verdict has been found for the plaintiff, or an injunction issued, the court may order that all labels, signs, prints, packages, wrappers, or receptacles in the possession of the defendant, bearing the trade-mark of the plaintiff or complainant, or any reproduction, counterfeit, copy, or colorable imitation thereof, shall be delivered up and destroyed. Any injunction that may be granted upon hearing, after notice to the defendant, to prevent the violation of any right of the owner of a trade-mark registered in accordance with the provisions of this act, by any circuit court of the United States, or by a judge thereof, may be served on the parties against whom such injunction may be granted anywhere in the United States where they may be found, and shall be operative, and may be enforced by proceedings to punish for contempt, or otherwise, by the court by which such injunction was granted, or by any other circuit court, or judge thereof, in the United States, or by the Supreme Court of the District of Columbia, or a judge thereof. The said courts, or judges thereof, shall have jurisdiction to enforce said injunction, as herein provided, as fully as if the injunction had been granted by the circuit court in which it is sought to be enforced. The clerk of the court or judge granting the injunction shall, when required to do so by the court before which application to enforce said injunction is made, transfer without delay to said court a certified copy of all the papers on which the said injunction was granted that are on file in his office.

Sec. 21. That no action or suit shall be maintained under the provisions of this act in any case when the trade-mark is used in unlawful business, or upon any article injurious in itself, or which mark has been used with the design of deceiving the public in the purchase of merchandise, or has been abandoned, or upon any certificate of registration fraudulently obtained.

Sec. 22. That whenever there are interfering registered trade-marks, any person interested in any one of them may have relief against the interfering registrant, and all persons interested under him, by suit in equity against the said registrant, and the court, on notice to adverse parties and other due proceedings had according to the course of equity, may adjudge and declare either of the registrations void in whole or in part according to the interest of the parties in the trade-mark, and may order the certificate of registration to be delivered up to the Commissioner of Patents for cancellation.

Sec. 23. That nothing in this act shall prevent, lessen, impeach, or avoid any remedy at law or in equity which any party aggrieved by any wrongful use of any trade-mark might have had if the provisions of this act had not been passed.

Sec. 24. That all applications for registration pending in the office of the Commissioner of Patents at the time of the passage of this act may be amended with a view to bringing them, and the certificates issued upon such applications, under its provisions, and the prosecution of such applications may be proceeded with under the provisions of this act.

Sec. 25. That any person who shall procure registration of a trade-mark, or entry thereof, in the office of the Commissioner of Patents by a false or fraudulent declaration or representation, oral or in writing, or by any false means, shall be liable to pay any damages sustained in consequence thereof to the injured party, to be recovered by an action on the case.

Sec. 26. That the Commissioner of Patents is authorized to make rules and regulations, not inconsistent with law, for the conduct of proceedings in reference to the registration of trade-marks provided for by this act.

Sec. 27. That no article of imported merchandise which shall copy or simulate the name of any domestic manufacture, or manufacturer or trader, or of any manufacturer or trader located in any foreign country which, by treaty, convention, or law affords similar privileges to citizens of the United States, or which shall copy or simulate a trade-mark registered in accordance with the provisions of this act or shall bear a name or mark calculated to induce the public to believe that the article is manufactured in the United States, or that it is manufactured in any foreign country or locality other than the country or locality in which it is in fact manufactured, shall be admitted to entry at any custom house of the United States, and, in order to aid the officers of the customs in enforcing this prohibition, any domestic manufacturer or trader, and any foreign manufacturer or trader, who is entitled under the provisions of a treaty, convention, declaration or agreement between the United States and any foreign country to the advantages afforded by law to citizens of the United States in respect to trade-marks and commercial names,

may require his name and residence, and the name of the locality in which his goods are manufactured, and a copy of the certificate of registration of his trade-mark, issued in accordance with the provisions of this act, to be recorded in books which shall be kept for this purpose in the Department of the Treasury, under such regulations as the Secretary of the Treasury shall prescribe, and may furnish to the department facsimiles of his name, the name of the locality in which his goods are manufactured, or of his registered trade-mark; and thereupon the Secretary of the Treasury shall cause one or more copies of the same to be transmitted to each collector or other proper officer of the customs.

Sec. 28. That it shall be the duty of the registrant to give notice to the public that a trade-mark is registered, either by affixing thereon the words "Registered in U. S. Patent Office," or abbreviated thus, "Reg. U. S. Pat. Off.," or when, from the character or size of the trade-mark, or from its manner of attachment to the article to which it is appropriated, this cannot be done, then by affixing a label containing a like notice to the package or receptacle wherein the article or articles are inclosed; and in any suit for infringement by a party failing so to give notice of registration no damages shall be recovered, except on proof that the defendant was duly notified of infringement and continued the same after such notice.

Sec. 29. That in construing this act the following rules must be observed, except where the contrary intent is plainly apparent from the context thereof: The United States includes and embraces all territory which is under the jurisdiction and control of the United States. The word "States" includes and embraces the District of Columbia, the Territories of the United States, and such other territory as shall be under the jurisdiction and control of the United States. The terms "person" and "owner," and any other word or term used to designate the applicant or other entitled to a benefit or privilege or rendered liable under the provisions of this act, include a firm, corporation, or association as well as a natural person. The terms "applicant" and "registrant" embrace the successors and assigns of such applicant or registrant. The term "trade-mark" includes any mark which is entitled to registration under the terms of this act, and whether registered or not, and a trade-mark shall be deemed to be "affixed" to an article when it is placed in any manner in or upon either the article itself or the receptacle or package or upon the envelope or other thing in, by, or with which the goods are packed or inclosed or otherwise prepared for sale or distribution.

Sec. 30. That this act shall be in force and take effect April first, nineteen hundred and five. All acts and parts of acts inconsistent with this act are hereby repealed except so far as the same may apply to certificates of registration issued under the act of Congress approved March third, eighteen hundred and eighty-one, entitled "An act to authorize the registration of trade-marks and protect the same," or under the act approved August fifth, eighteen hundred and eighty-two, entitled "An act relating to the registration of trade-marks."

Approved February 20, 1905.

ACT OF MAY 4, 1906.

AN ACT To amend the laws of the United States relating to the registration of trade-marks.

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Sec. 2. That the Commissioner of Patents shall establish classes of merchandise for the purpose of trade-mark registration, and shall determine the particular descriptions of goods comprised in each class. On a single application for registration of a trade-mark the trade-mark may be registered at the option of the applicant for any or all goods upon which the mark has actually been used comprised in a single class of merchandise, provided the particular descriptions of goods be stated.

Sec. 3. That any owner of a trade-mark who shall have a manufacturing establishment within the territory of the United States shall be accorded, so far as the registration and protection of trade-marks used on the products of such establishment are concerned, the same rights and privileges that are accorded to owners of trade-marks domiciled within the territory of the United States by the act entitled "An act to authorize the registration of trade-marks used in commerce with foreign nations or among the several States or with Indian tribes, and to protect the same," approved February twentieth, nineteen hundred and five.

Sec. 4. That this act shall take effect July first, nineteen hundred and six.

Act to incorporate the American National Red Cross, approved January 5, 1905 (as amended June 23, 1910).

Sec. 4. That from and after the passage of this act it shall be unlawful for any person within the jurisdiction of the United States to falsely or fraudulently hold himself out as or represent or pretend himself to be a member of or an agent for the American National Red Cross for the purpose of soliciting, collecting, or receiving money or material; or for any person to wear or display the sign of the Red Cross or any insignia colored in imitation thereof for the fraudulent purpose of inducing the belief that he is a member of or an agent for the American National Red Cross. It shall be unlawful for any person, corporation, or association other than the American National Red Cross and its duly authorized employees and agents and the Army and Navy sanitary and hospital authorities of the United States, for the purpose of trade or as an advertisement, to induce the sale of any article whatsoever or for any business or charitable purpose to use within the territory of the United States of America and its exterior possessions the emblem of the Greek Red Cross on a white ground, or any sign or insignia made or colored in imitation thereof, or of the words "Red Cross" or "Geneva Cross" or any combination of these words: Provided, however, That no person, corporation, or association that actually used or whose assignor actually used the said emblem, sign, insignia, or words for any lawful purpose prior to January fifth, nineteen hundred and five shall be deemed forbidden by this act to continue the use thereof for the same purpose and for the same class of goods. If any person violates the provision of this section he shall be deemed guilty of a misdemeanor, and upon conviction in any Federal court shall be liable to a fine of not less than one or more than five hundred dollars, or imprisonment for a

term not exceeding one year, or both, for each and every offense.

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Sec. 8. That the endowment fund of the American National Red Cross shall be kept and invested under the management and control of a board of nine trustees, who shall be elected from time to time by the incorporators and their successors under such regulations regarding terms and tenure of office, accountability, and expense as said incorporators and successors shall prescribe.

THE COPYRIGHT LAW OF THE UNITED STATES.*

CONSTITUTION, 1787.

Art. 1, Sec. 8. The Congress shall have power: .... To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

AN ACT TO AMEND AND CONSOLIDATE THE ACTS RESPECTING COPYRIGHT. MARCH 4, 1909.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person entitled thereto, upon complying with the provisions of this Act, shall have the exclusive right:

(a) To print, reprint, publish, copy, and vend the copyrighted work;

(b) To translate the copyrighted work into other languages or dialects, or make any other version thereof, if it be a literary work; to dramatize it if it be a nondramatic work; to convert it into a novel or other nondramatic work if it be a drama; to arrange or adapt it if it be a musical work; to complete, execute, and finish it if it be a model or design for a work of art;

(c) To deliver or authorize the delivery of the copyrighted work in public for profit if it be a lecture, sermon, address, or similar production;

(d) To perform or represent the copyrighted work publicly if it be a drama or, if it be a dramatic work and not reproduced in copies for sale, to vend any manuscript or any record whatsoever thereof; to make or to procure the making of any transcription or record thereof by or from which, in whole or in part, it may in any manner or by any method be exhibited, performed, represented, produced, or reproduced; and to exhibit, perform, represent, produce, or reproduce it in any manner or by any method whatsoever;

(e) To perform the copyrighted work publicly for profit if it be a musical composition and for the purpose of public performance for profit; and for the purposes set forth in subsection (a) hereof, to make any arrangement or setting of it or of the melody of it in any system of notation or any form of record in which the thought of an author may be recorded and from which it may be read or reproduced: Provided, That the provisions of this Act, so far as they secure copyright controlling the parts of instruments serving to reproduce mechanically the musical work, shall include only compositions published and copyrighted after this Act goes into effect, and shall not include the works of a foreign author or composer unless the foreign state or nation of which such author or composer is a citizen or subject grants, either by treaty, convention, agreement, or law, to citizens of the United States similar rights: And provided, further, and as a condition of extending the copyright control to such mechanical reproductions, That whenever the owner of a musical copyright has used or permitted or knowingly acquiesced in the use of the copyrighted work upon the parts of instruments serving to reproduce mechanically the musical work, any other person may make similar use of the copyrighted work upon the payment to the copyright proprietor of a royalty of two cents on each such part manufactured, to be paid by the manufacturer thereof, and the copyright proprietor may require, and if so the manufacturer shall furnish, a report under oath on the twentieth day of each month on the number of parts of instruments manufactured during the previous month serving to reproduce mechanically said musical work, and royalties shall be due on the parts manufactured during any month upon the twentieth of the next succeeding month. The payment of the royalty provided for by this section shall free the articles or devices for which such royalty has been paid from further contribution to the copyright except in case of public performance for profit: And provided further, That it shall be the duty of the copyright owner, if he uses the musical composition himself for the manufacture of parts of instruments serving to reproduce mechanically the musical work, or licenses others to do so, to file notice thereof, accompanied by a recording fee, in the copyright office, and any failure to file such notice shall be a complete defense to any suit, action, or proceeding for any infringement of such copyright.

In case of the failure of such manufacturer to pay to the copyright proprietor within thirty days after demand in writing the full sum of royalties due at said rate at the date of such demand the court may award taxable costs to the plaintiff and a reasonable counsel fee, and the court may, in its discretion, enter judgment therein for any sum in addition over the amount found to be due as royalty in accordance with the terms of this Act, not exceeding three times such amount.

The reproduction or rendition of a musical composition by or upon coin-operated machines shall not be deemed a public performance for profit unless a fee is charged for admission to the place where such reproductions or rendition occurs.

Sec. 2. That nothing in this Act shall be construed to annul or limit the right of the author or proprietor of an unpublished work, at common law or in equity, to prevent the copying, publication, or use of such unpublished work without his consent, and to obtain damages therefor.

Sec. 3. That the copyright provided by the Act shall protect all the copyrightable component parts of the work copyrighted, and all matter therein in which copyright is already subsisting, but without extending the duration or scope of such copyright. The copyright upon composite works or periodicals shall give to the proprietor thereof all the rights in respect thereto which he would have if each

*Slightly abridged for this book by Munn & Co., Patent Attorneys.

part were individually copyrighted under this Act.

Sec. 4. That the works for which copyright may be secured under this Act shall include all the writings of an author.

Sec. 5. That the application for registration shall specify to which of the following classes the work in which copyright is claimed belongs:

(a) Books, including composite and cyclopaedic works, directories, gazetteers, and other compilations;

(b) Periodicals, including newspapers;

(c) Lectures, sermons, addresses, prepared for oral delivery;

(d) Dramatic or dramatico-musical compositions;

(e) Musical compositions;

(f) Maps;

(g) Works of art; models or designs for works of art;

(h) Reproductions of a work of art;

(i) Drawings or plastic works of a scientific or technical character;

(j) Photographs;

(k) Prints and pictorial illustrations:

Provided, nevertheless, That the above specifications shall not be held to limit the subject-matter of copyright as defined in section four of this Act, nor shall any error in classification invalidate or impair the copyright protection secured under this Act.

Sec. 6. That compilations or abridgments, adaptations, arrangements, dramatizations, translations, or other versions of works in the public domain, or of copyrighted works when produced with the consent of the proprietor of the copyright in such works, or works republished with new matter, shall be regarded as new works subject to copyright under the provisions of this Act; but the publication of any such new works shall not affect the force or validity of any subsisting copyright upon the matter employed or any part thereof, or be construed to imply an exclusive right to such use of the original works, or to secure or extend copyright in such original works.

Sec. 7. That no copyright shall subsist in the original text of any work which is in the public domain, or in any work which was published in this country or any foreign country prior to the going into effect of this Act and has not been already copyrighted in the United States, or in any publication of the United States Government, or any reprint, in whole or in part, thereof: Provided, however, That the publication or republication by the Government, either separately or in a public document, of any material in which copyright is subsisting, shall not be taken to cause any abridgment or annulment of the copyright or to authorize any use or appropriation of such copyright material without the consent of the copyright proprietor.

Sec. 8. That the author or proprietor of any work made the subject of copyright by this Act, or his executors, administrators, or assigns, shall have copyright for such work under the conditions and for the terms specified in this Act: Provided, however, That the copyright secured by this Act shall extend to the work of an author or proprietor who is a citizen or subject of a foreign state or nation, only:

(a) When an alien author or proprietor shall be domiciled within the United States at the time of the first publication of his work; or

(b) When the foreign state or nation of which such author or proprietor is a citizen or subject grants, either by treaty, convention, agreement, or law, to citizens of the United States the benefit of copyright on substantially the same basis as to its own citizens, or copyright protection substantially equal to the protection secured to such foreign author under this Act or by treaty; or when such foreign state or nation is a party to an international agreement which provides for reciprocity in the granting of copyright, by the terms of which agreement the United States may, at its pleasure, become a party thereto.

The existence of the reciprocal conditions aforesaid shall be determined by the President of the United States, by proclamation made from time to time, as the purposes of this Act may require.

Sec. 9. That any person entitled thereto by this Act may secure copyright for his work by publication thereof with the notice of copyright required by this Act; and such notice shall be affixed to each copy thereof published or offered for sale in the United States by authority of the copyright proprietor, except in the case of books seeking ad interim protection under section twenty-one of this Act.

Sec. 10. That such person may obtain registration of his claim to copyright by complying with the provisions of this Act, including the deposit of copies, and upon such compliance the register of copyrights shall issue to him the certificate provided for in section fifty-five of this Act.

Sec. 11. That copyright may also be had of the works of an author of which copies are not reproduced for sale, by the deposit, with claim of copyright, of one complete copy of such work if it be a lecture or similar production or a dramatic or musical composition; of a photographic print if the work be a photograph; or of a photograph or other identifying reproduction thereof if it be a work of art or a plastic work or drawing. But the privilege of registration of copyright secured hereunder shall not exempt the copyright proprietor from the deposit of copies under sections twelve and thirteen of this Act where the work is later reproduced in copies for sale.

* * *

Sec. 13. That should the copies called for by this Act not be promptly deposited as herein provided, the register of copyrights may at any time after the publication of the work, upon actual notice, require the proprietor of the copyright to deposit them, and after the said demand shall have been made, in default of the deposit of copies of the work within three months from any part of the United States, except an outlying territorial possession of the United States, or within six months from any outlying territorial possession of the United States, or from any foreign country, the proprietor of the copyright shall be liable to a fine of one hundred dollars and to pay to the Library of Congress twice the amount of the retail price of the best edition of the work, and the copyright shall become void.

* * *

Sec. 15. That of the printed book or periodical specified in section five, subsections (a) and (b) of this Act, except the original text of a book of foreign origin in a language or languages other than English, the text of all copies accorded protection under this Act, except as below provided, shall be printed from type set within the limits of the United States, either by hand or by the aid of any kind of typesetting machine, or from plates made within the limits of the United States from type set therein, or, if the text be

produced by lithographic process, or photo-engraving process, then by a process wholly performed within the limits of the United States, and the printing of the text and binding of the said book shall be performed within the limits of the United States; which requirements shall extend also to the illustrations within a book consisting of printed text and illustrations produced by lithographic process, or photo-engraving process, and also to separate lithographs or photo-engravings, except where in either case the subjects represented are located in a foreign country and illustrate a scientific work or reproduce a work of art; but they shall not apply to works in raised characters for the use of the blind, or to books of foreign origin in a language or languages other than English, or to books published abroad in the English language seeking ad interim protection under this Act.

* * *

Sec. 18. That the notice of copyright required by section nine of this Act shall consist either of the word "Copyright" or the abbreviation "Copr.", accompanied by the name of the copyright proprietor, and if the work be a printed literary, musical, or dramatic work, the notice shall include also the year in which the copyright was secured by publication. In the case, however, of copies of works specified in subsections (f) to (k), inclusive, of section five of this Act, the notice may consist of the letter C inclosed within a circle, accompanied by the initials, monogram, mark, or symbol of the copyright proprietor: Provided, That on some accessible portion of such copies or of the margin, back, permanent base, or pedestal, or of the substance on which such copies shall be mounted, his name shall appear. But in the case of works in which copyright is subsisting when this Act shall go into effect, the notice of copyright may be either in one of the forms prescribed herein or in one of those prescribed by the Act of June eighteenth, eighteen hundred and seventy-four.

Sec. 19. That the notice of copyright shall be applied, in the case of a book or other printed publication upon its title-page or the page immediately following, or if a periodical either upon the title-page or upon the first page of text of each separate number or under the title heading, or if a musical work either upon its title-page or the first page of music: Provided, That one notice of copyright in each volume or in each number of a newspaper or periodical published shall suffice.

Sec. 20. That where the copyright proprietor has sought to comply with the provisions of this Act with respect to notice, the omission by accident or mistake of the prescribed notice from a particular copy or copies shall not invalidate the copyright or prevent recovery for infringement against any person who, after actual notice of the copyright, begins an undertaking to infringe it, but shall prevent the recovery of damages against an innocent infringer who has been misled by the omission of the notice; and in a suit for infringement no permanent injunction shall be had unless the copyright proprietor shall reimburse to the innocent infringer his reasonable outlay innocently incurred if the court, in its discretion, shall so direct.

Sec. 21. That in the case of a book published abroad in the English language before publication in this country, the deposit in the copyright office, not later than thirty days after its publication abroad, of one complete copy of the foreign edition, with a request for the reservation of the copyright and a statement of the name and nationality of the author and of the copyright proprietor and of the date of publication of the said book, shall secure to the author or proprietor an ad interim copyright, which shall have all the force and effect given to copyright by this Act, and shall endure until the expiration of thirty days after such deposit in the copyright office.

Sec. 22. That whenever within the period of such ad interim protection an authorized edition of such book shall be published within the United States, in accordance with the manufacturing provisions specified in section fifteen of this Act, and whenever the provisions of this Act as to deposit of copies, registration, filing of affidavit, and the printing of the copyright notice shall have been duly complied with, the copyright shall be extended to endure in such book for the full term elsewhere provided in this Act.

Sec. 23. That the copyright secured by this Act shall endure for twenty-eight years from the date of first publication, whether the copyrighted work bears the author's true name or is published anonymously or under an assumed name: Provided, That in the case of any posthumous work or of any periodical, cyclopaedic, or other composite work upon which the copyright was originally secured by the proprietor thereof, or of any work copyrighted by a corporate body (otherwise than as assignee or licensee of the individual author) or by an employer for whom such work is made for hire, the proprietor of such copyright shall be entitled to a renewal and extension of the copyright in such work for the further term of twenty-eight years when application for such renewal and extension shall have been made to the copyright office and duly registered therein within one year prior to the expiration of the original term of copyright: And provided further, That in the case of any other copyrighted work, including a contribution by an individual author to a periodical or to a cyclopaedic or other composite work when such contribution has been separately registered, the author of such work, if still living, or the widow, widower, or children of the author, if the author be not living, or if such author, widow, widower, or children be not living, then the author's executors, or in the absence of a will, his next of kin shall be entitled to a renewal and extension of the copyright in such work for a further term of twenty-eight years when application for such renewal and extension shall have been made to the copyright office and duly registered therein within one year prior to the expiration of the original term of copyright: And provided further, That in default of the registration of such application for renewal and extension, the copyright in any work shall determine at the expiration of twenty-eight years from first publication.

Sec. 24. That the copyright subsisting in any work at the time when this Act goes into effect may, at the expiration of the term provided for under existing law, be renewed and extended by the author of such work if still living, or the widow, widower, or children of the author, if the author be not living, or if such author, widow, widower, or children be not living, then by the author's executors, or in the absence of a will, his next of kin, for a further period such that the entire term shall be equal to that secured by this Act,

including the renewal period: Provided, however, That if the work be a composite work upon which copyright was originally secured by the proprietor thereof, then such proprietor shall be entitled to the privilege of renewal and extension granted under this section: Provided, That application for such renewal and extension shall be made to the copyright office and duly registered therein within one year prior to the expiration of the existing term.

Sec. 25. That if any person shall infringe the copyright in any work protected under the copyright laws of the United States such person shall be liable:

(a) To an injunction restraining such infringement;

(b) To pay to the copyright proprietor such damages as the copyright proprietor may have suffered due to the infringement, as well as all the profits which the infringer shall have made from such infringement, and in proving profits the plaintiff shall be required to prove sales only and the defendant shall be required to prove every element of cost which he claims, or in lieu of actual damages and profits such damages as to the court shall appear to be just, and in assessing such damages the court may, in its discretion, allow the amounts as hereinafter stated, but in the case of a newspaper reproduction of a copyrighted photograph such damages shall not exceed the sum of two hundred dollars nor be less than the sum of fifty dollars, and such damages shall in no other case exceed the sum of five thousand dollars nor be less than the sum of two hundred and fifty dollars, and shall not be regarded as a penalty:

First. In the case of a painting, statue, or sculpture, ten dollars for every infringing copy made or sold by or found in the possession of the infringer or his agents or employees;

Second. In the case of any work enumerated in section five of this Act, except a painting, statue, or sculpture, one dollar for every infringing copy made or sold by or found in the possession of the infringer or his agents or employees;

Third. In the case of a lecture, sermon, or address, fifty dollars for every infringing delivery;

Fourth. In the case of a dramatic or dramatico-musical or a choral or orchestral composition, one hundred dollars for the first and fifty dollars for every subsequent infringing performance; in the case of other musical compositions, ten dollars for every infringing performance;

(c) To deliver up on oath, to be impounded during the pendency of the action, upon such terms and conditions as the court may prescribe, all articles alleged to infringe a copyright;

(d) To deliver up on oath for destruction all the infringing copies or devices, as well as all plates, molds, matrices, or other means for making such infringing copies as the court may order;

(e) Whenever the owner of a musical copyright has used or permitted the use of the copyrighted work upon the parts of musical instruments serving to reproduce mechanically the musical work, then in case of infringement of such copyright by the unauthorized manufacture, use, or sale of interchangeable parts, such as disks, rolls, bands, or cylinders for use in mechanical music-producing machines adapted to reproduce the copyrighted music, no criminal action shall be brought, but in a civil action an injunction may be granted upon such terms as the court may impose, and the plaintiff shall be entitled to recover in lieu of profits and damages a royalty as provided in section one, subsection (e), of this Act: Provided also, That whenever any person, in the absence of a license agreement, intends to use a copyrighted musical composition upon the parts of instruments serving to reproduce mechanically the musical work, relying upon the compulsory license provision of this Act, he shall serve notice of such intention, by registered mail, upon the copyright proprietor at his last address disclosed by the records of the copyright office, sending to the copyright office a duplicate of such notice; and in case of his failure so to do the court may, in its discretion, in addition to sums hereinabove mentioned, award the complainant a further sum, not to exceed three times the amount provided by section one, subsection (e), by way of damages, and not as a penalty, and also a temporary injunction until the full award is paid.

Rules and regulations for practice and procedure under this section shall be prescribed by the Supreme Court of the United States.

* * *

Sec. 28. That any person who willfully and for profit shall infringe any copyright secured by this Act, or who shall knowingly and willfully aid or abet such infringement, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by imprisonment for not exceeding one year or by a fine of not less than one hundred dollars nor more than one thousand dollars, or both, in the discretion of the court: Provided, however, That nothing in this Act shall be so construed as to prevent the performance of religious or secular works, such as oratorios, cantatas, masses, or octavo choruses by public schools, church choirs, or vocal societies, rented, borrowed, or obtained from some public library, public school, church choir, school choir, or vocal society, provided the performance is given for charitable or educational purposes and not for profit.

Sec. 29. That any person who, with fraudulent intent, shall insert or impress any notice of copyright required by this Act, or words of the same purport, in or upon any uncopyrighted article, or with fraudulent intent shall remove or alter the copyright notice upon any article duly copyrighted shall be guilty of a misdemeanor, punishable by a fine of not less than one hundred dollars and not more than one thousand dollars. Any person who shall knowingly issue or sell any article bearing a notice of United States copyright which has not been copyrighted in this country, or who shall knowingly import any article bearing such notice or words of the same purport, which has not been copyrighted in this country, shall be liable to a fine of one hundred dollars.

Sec. 30. That the importation into the United States of any article bearing a false notice of copyright when there is no existing copyright thereon in the United States, or of any piratical copies of any work copyrighted in the United States, is prohibited.

Sec. 31. That during the existence of the American copyright in any book the importation into the United States of any piratical copies thereof or of any copies thereof (although authorized by the author or proprietor) which have not been produced in accordance with the manufacturing provisions specified in section fifteen of this Act, or any plates

of the same not made from type set within the limits of the United States, or any copies thereof produced by lithographic or photo-engraving process not performed within the limits of the United States, in accordance with the provisions of section fifteen of this Act, shall be, and is hereby, prohibited: Provided, however, That, except as regards piratical copies, such prohibition shall not apply:

(a) To works in raised characters for the use of the blind;

(b) To a foreign newspaper or magazine, although containing matter copyrighted in the United States printed or reprinted by authority of the copyright proprietor, unless such newspaper or magazine contains also copyright matter printed or reprinted without such authorization;

(c) To the authorized edition of a book in a foreign language or languages of which only a translation into English has been copyrighted in this country.

(d) To any book published abroad with the authorization of the author or copyright proprietor when imported under the circumstances stated in one of the four subdivisions following, that is to say:

First. When imported, not more than one copy at one time, for individual use and not for sale; but such privilege of importation shall not extend to a foreign reprint of a book by an American author copyrighted in the United States;

Second: When imported by the authority or for the use of the United States;

Third. When imported, for use and not for sale, not more than one copy of any such book in any one invoice, in good faith, by or for any society or institution incorporated for educational, literary, philosophical, scientific, or religious purposes, or for the encouragement of the fine arts, or for any college, academy, school, or seminary of learning, or for any State, school, college, university, or free public library in the United States;

Fourth. When such books form parts of libraries or collections purchased en bloc for the use of societies, institutions, or libraries designated in the foregoing paragraph, or form parts of the libraries or personal baggage belonging to persons or families arriving from foreign countries and are not intended for sale:

Provided, That copies imported as above may not lawfully be used in any way to violate the rights of the proprietor of the American copyright or annul or limit the copyright protection secured by this Act, and such unlawful use shall be deemed an infringement of copyright.

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Sec. 41. That the copyright is distinct from the property in the material object copyrighted, and the sale or conveyance, by gift or otherwise, of the material object shall not of itself constitute a transfer of the copyright, nor shall the assignment of the copyright constitute a transfer of the title to the material object; but nothing in this Act shall be deemed to forbid, prevent, or restrict the transfer of any copy of a copyrighted work the possession of which has been lawfully obtained.

Sec. 42. That copyright secured under this or previous Acts of the United States may be assigned, granted, or mortgaged by an instrument in writing signed by the proprietor of the copyright, or may be bequeathed by will.

Sec. 43. That every assignment of copyright executed in a foreign country shall be acknowledged by the assignor before a consular officer or secretary of legation of the United States authorized by law to administer oaths or perform notarial acts. The certificate of such acknowledgment under the hand and official seal of such consular officer or secretary of legation shall be prima facie evidence of the execution of the instrument.

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Sec. 44. That every assignment of copyright shall be recorded in the copyright office within three calendar months after its execution in the United States or within six calendar months after its execution without the limits of the United States, in default of which it shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, whose assignment has been duly recorded.

* * *

Sec. 46. That when an assignment of the copyright in a specified book or other work has been recorded the assignee may substitute his name for that of the assignor in the statutory notice of copyright prescribed by this Act.

Sec. 62. That in the interpretation and construction of this Act "the date of publication" shall in the case of a work of which copies are reproduced for sale or distribution be held to be the earliest date when copies of the first authorized edition were placed on sale, sold, or publicly distributed by the proprietor of the copyright or under his authority, and the word "author" shall include an employer in the case of works made for hire.

Sec. 63. That all laws or parts of laws in conflict with the provisions of this Act are hereby repealed, but nothing in this Act shall affect causes of action for infringement of copyright heretofore committed now pending in courts of the United States, or which may hereafter be instituted; but such causes shall be prosecuted to a conclusion in the manner heretofore provided by law.

Sec. 64. That this Act shall go into effect on the first day of July, nineteen hundred and nine.




EARLY TYPES OF SEWING MACHINES.

CHAPTER XIV.

ARMIES OF THE WORLD.

INFANTRY.

The real basis of the infantry organization of all foreign armies is the battalion. Except for England, the typical battalion is composed of 4 companies and has a strength on the war footing of some 20 to 25 officers and 900 to 1,100 men, counting from about 900 to 1,000 rifles. In England the battalion numbers 8 companies and counts about 860 rifles on the war footing.

In speaking of a foreign battalion it must, therefore, be borne in mind that its fighting strength is roughly equal to that of two of our battalions.

CAVALRY.

The basis of all foreign cavalry organization is the squadron. The foreign squadron numbers on a war footing from 120 to 150 sabers. Regiments contain from 3 to 6 squadrons.

It will therefore be noted that in speaking of a foreign squadron we mean a force of about one-half the strength of the United States squadron. Similarly, the cavalry regiment of foreign services is about one-half, or less, the strength of our regiments.

FIELD ARTILLERY.

The battery is usually taken as the unit of field artillery organization. For the purposes of comparison a more correct unit is the battalion.

Leaving Russia aside, it may be said that there are two great systems of field artillery organization. These may be called, naming them after their great exponents, the French and the German. The essential differences between these two systems may be summarized as follows:

The French system takes 4 guns as the firing unit, the battery, and assigns all of the ammunition which should be available *upon entry into action* to the battery; batteries count 5 officers, sometimes 4, and 170 men.

Under the German system the firing unit, battery, counts 6 guns, and only so much ammunition as is needed for the *immediate* service of the pieces is assigned to the batteries; the remainder of the ammunition which should be available *upon entry into action* being assembled in an ammunition battery (light ammunition column), which forms an *integral* part of the battalion.

In both systems the number of firing batteries in the battalion is three; the German system having an additional battery for ammunition gives that system 4 battery organizations to the battalion.

Under the German system the strength of firing batteries is about 5 officers and 150 men and that of ammunition batteries is 4 officers and 188 men. The strength of battalion staffs is not dependent upon the particular system.

FORTRESS ARTILLERY.

In most foreign services all artillery is on one list. That branch of artillery known as fortress artillery has no counterpart in our service. Fortress artillery garrisons the land fortresses of the country and furnishes artillery of various types to the mobile troops. The amount of mobile artillery which would be provided by the foot artillery in war is naturally dependent upon the character of the war, whether offensive or defensive, etc. It is, therefore, impossible to say by how much the artillery with the mobile troops, as shown in the tables, would be augmented in war.

COAST ARTILLERY.

The coast artillery shown for Germany does not give a correct idea, for many of the coast fortifications of that country are garrisoned by marines.

SANITARY TROOPS.

While the number of sanitary troops shown by the tables is small for foreign armies as compared with the number maintained by the United States, it should be borne in mind that in war much of the "bearer and first-aid duty" is performed in foreign services by men drawn from and forming part of the line. Furthermore, drivers for ambulances and for other non-technical purposes are drawn from the train. The necessity for maintaining a nucleus in peace for expansion in war does not therefore exist in the same degree in foreign countries as in the United States. Similar remarks are, however, true for services other than sanitary.

EXPANSION ON MOBILIZATION.

In all foreign countries of any consequence large numbers of *fully trained* reserves exist. These men are assigned to organizations, and in those organizations complete equipment of every kind and description is so stored as to facilitate immediate issue. Every horse in civil life has its place assigned and its owner is warned as to where it is to be turned in on mobilization; the same is true of vehicles. In the formation of certain classes of trains the Government simply directs teamsters with their teams, harness, and wagons to report at previously specified places. It is thus simply a matter of hours for the great powers to mobilize.

Inasmuch as the frontiers of possible enemies adjoin their own, and the functioning of the mobilization of those enemies is equally complete, all nations on the continent of Europe maintain their cavalry and horse artillery at practically war strength and station those arms on the frontiers to secure the few hours which are necessary for mobilization.

TABLE SHOWING PEACE STRENGTH, BY ARMS OF THE SERVICE.

ONLY OFFICERS AND MEN WITH THE COLORS ARE CONSIDERED.

Country.	Infantry.	Cavalry.	Field artillery.	Foot artillery.	Coast artillery.	Technical troops.	Train.	Sanitary troops.	Total peace strength.[1]
France[2]	379,640	75,510	76,419	4,446	7,246	18,020	10,520	6,123	634,638
Germany	404,765	73,368	69,735	24,673	2,000	26,708	8,038	6,615	634,320
Austria[3]	194,123	47,541	33,012	6,040	2,100	10,507	5,070	4,307	327,580
Russia	580,000	115,000	94,110	18,056	14,152	37,448	(?)	(?)	1,200,000
England[4]	151,261	20,716	34,649	628	14,965	9,096	6,772	5,069	255,438
Italy	167,000	24,000	27,000	7,000	5,000	11,000	2,500	3,729	288,409
Mexico	20,326	7,318	1,912	(?)	(?)	657	215	(?)	31,000-32,000
Japan	149,402	14,585	18,918	6,889		16,727	11,427	3,484	230,000
UNITED STATES.									
Regulars[5]	27,370	13,540	5,456	0	19,993	3,449	0	4,117	81,361
Organized militia	97,035	4,167	4,565	0	7,256	2,539	0	2,146	119,660
Total	124,405	17,707	10,021	0	27,249	5,988	0	6,263	201,021

[1] Includes miscellaneous organizations, staffs, school detachments, etc.
[2] Includes troops stationed in Algiers and Tunis and such colonial troops as are stationed in France.
[3] Common army only. For Landwehr, see study on Austria.
[4] Regular army only. Indian army, colonial forces, and territorial forces are mentioned in study on England. Territorial force (British Isles) numbers 315,408. Canadian permanent force and organized militia numbers 67,037.
[5] Based on Army List, 20 November, 1910. The Porto Rican Regiment is counted as infantry. Technical troops include Engineers and Signal Corps. 8,000 recruits included in total. 5,000 Philippine Scouts are not counted.

ARMIES OF THE MINOR POWERS.

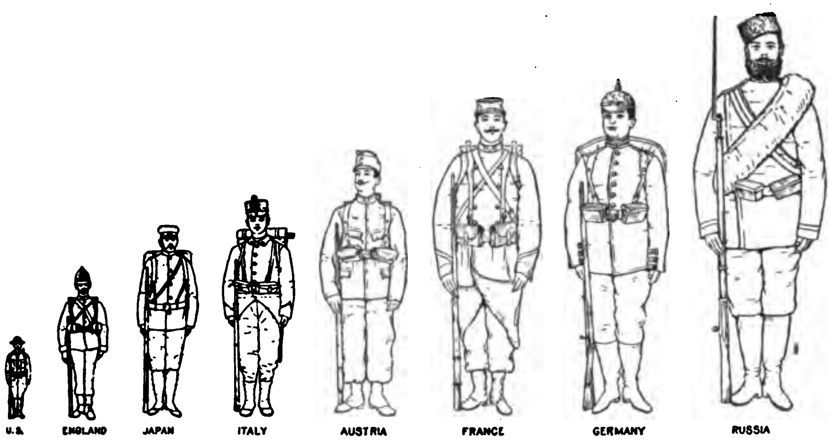
The number of men, peace and war footing, of the minor powers, is estimated as follows: Belgium, a peace footing of 47,000 men; war footing, 188,000; Bulgaria, peace footing, 57,800; war footing, 375,000; China, peace footing, 240,000 trained men; Denmark, peace footing, 12,000; war footing, 66,000; India (British), peace footing, 162,000; war footing, 220,000 (native troops only); Greece; peace footing, 20,000; war footing, 100,000; Holland, peace footing, 34,000; war footing, 175,000; Roumania, peace footing, 93,000; war footing, 350,000; Spain, peace footing, 115,000; war footing, 500,000; Sweden, peace footing, 69,000; war footing, 420,000; Switzerland, peace footing, 21,000; war footing, 270,000; Turkey, peace footing, 375,000; war footing, 1,000,000.

TABLE SHOWING HIGHER ORGANIZATIONS EXISTING IN TIME OF PEACE.

NO MILITIA, RESERVE, OR TERRITORIAL TROOPS ARE INCLUDED.

Country.	Army corps.	Divisions.	Cavalry divisions.	Infantry brigades.	Cavalry brigades.	Field-artillery brigades.
France	21	47	8	92	38	21
Germany	23	48	1	106	49	46
Austria [1]	16	33	5	58	19	16
Russia	31	56	23	143	[2] 46	61
England [3]	0	6	0	18	4	6
Italy	12	25	3	51	8	12
Mexico	0	0	0	0	0	0
Japan	0	19	0	39	2	3
United States	0	0	0	0	0	0

[1] Common army only.
[2] Possibly more.
[3] Figures are for regulars in the British Isles only. In addition there are 14 divisions, 42 infantry brigades, 14 field-artillery brigades, and 14 mounted brigades of territorial troops in the British Isles. In India there are 9 divisions, 9 field-artillery brigades, and 8 cavalry brigades.



INFANTRY OF PRINCIPAL NATIONS.

ARMIES OF THE LEADING POWERS.

AUSTRIA-HUNGARY.

The dual monarchy of Austria-Hungary maintains three separate armies supported by the Empire, by Austria, and by Hungary, respectively. These armies are known as the common army, the Austrian (Cisleithane) Landwehr, and the Hungarian Landwehr, respectively. The two Landwehr armies differ, however, from the Landwehr of other countries in that they are maintained with the colors in time of peace. The common army is known as the first line, and the two Landwehr armies as the second line.

In the common army there are 16 army corps with 33 divisions. There are 15 divisions in the Landwehr. There are 5 cavalry divisions organized in peace; they are attached to the army corps and all belong to the common army. The common army has 58 brigades of infantry and 19 brigades of cavalry. In the Landwehr there are 30 brigades of infantry and probably 6 of cavalry. There are 16 brigades of field artillery in the common army, organized in peace.

The total peace strength of the common army and the Landwehr comprises 31,328 officers, including a certain number of officials classed as officers, and 363,919 men. It is impossible to give any definite accurate statements as to Austria's maximum mobilization or even as to her initial mobilization. A conservative estimate, however, places the

number of fully trained men subject to call at about 2,000,000. Assuming that the *initial* mobilization would be confined to raising existing organizations to a war footing we would have the following fighting strength of the three armies: Common army: 420,300 infantry rifles; 1,854 field guns; 37,800 cavalry sabres. Landwehr: 192,850 infantry rifles; 96 field guns; 15,150 cavalry sabres.

Service is compulsory between the ages of 19 and 42, and is divided into numerous categories. The most important of these are as follows: Common army, 3 years with the colors and 7 years with the first reserve; during the latter period the men are subject to call for three periods of training of 4 weeks each. Landwehr, 2 years with the colors and 10 years with the first reserve; during the latter period the men may be called for instruction under varying and complex rules.

ENGLAND.

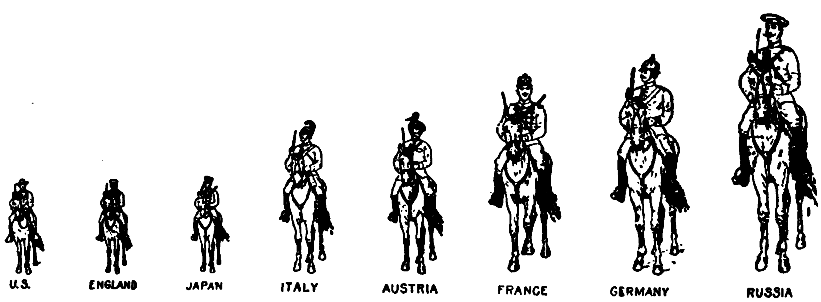
The military forces of England fall under several categories. The principal of these are: The regular forces, and the territorial forces. The regular forces are again divided into British forces—Indian forces and colonial forces. In addition, certain of the colonies, Canada, for example, maintain considerable forces of militia.

The British forces (regular) within the British Islands are organized into 6 divisions and 4 cavalry brigades. The territorial force has 14 divisions (similar to those of the regulars) and 14 mounted brigades. The forces in India, including regular and native, are divided into two armies, containing a total of 9 divisions and 8 cavâlry brigades. The division in India is smaller than is usually the rule (about 13,000).

The total peace strength of the regular army comprises 255,438 officers and men, distributed as follows: British Isles, 134,339 officers and men; Colonies (other than India), 45,215 officers and men; India, 75,884 officers and men. In addition there are 190 officers and 1,198 men employed with the special reserves, of whom there are 86,539. There are also 138,000 men in the army reserve, in addition to the special reserve. Combining the strength of the forces with the colors and the trained reserves, we have as the *trained* force which England is able to mobilize as her *Regular Establishment* a total of 481,365 officers and men. Service in the regular establishment is voluntary and the period of enlistment is usually for 12 years, of which a certain portion is passed with the colors and the remainder in the reserve. Service with the colors is usually 3, 7 or 8 years, depending

TABLE SHOWING PERCENTAGES OF SEVERAL ARMS OF TOTAL PEACE STRENGTH.

Country.	Infantry.	Cavalry.	Field artillery.	Foot artillery.	Coast artillery.	Technical troops.	Train.	Sanitary troops.	Miscellaneous.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
France	59.77	11.89	12.05	0.70	1.14	2.83	1.65	0.96	9.01
Germany	63.81	11.56	10.99	3.88	.33	4.21	1.26	1.04	2.02
Austria	59.34	14.51	10.07	1.84	.64	3.20	1.54	1.31	7.55
Russia	48.33	9.58	7.84	1.50	1.17	3.12	(?)	(?)	28.46
England	59.21	8.10	13.56	.24	5.85	3.56	2.65	1.98	4.85
Italy	57.90	8.32	9.36	2.42	1.73	3.81	.86	1.29	14.31
Mexico	63.50	22.86	5.97	(?)	(?)	2.05	.37	(?)	5.25
Japan	64.95	6.34	8.22	2.99		7.27	4.96	1.51	3.76
UNITED STATES.									
Regulars	33.64	16.64	6.66	0	24.57	4.23	0	5.06	9.20
Organized Militia	81.09	3.48	3.81	0	6.06	2.12	0	1.79	1.65
Total	61.70	8.80	5.07	0	13.55	2.97	0	3.11	4.80



CAVALRY OF PRINCIPAL NATIONS.

on the arm of the service and other conditions.

There is also the territorial force, which however, does not serve beyond the limits of the British Isles, except by its own consent. The total of this territorial force is about 315,408.

All the colonies maintain bodies of native troops. India has a native force of some 162,000 men. The Canadian forces are divided into the permanent and active militia; the combined peace strength of these two forces as authorized by law being 62,037 for the active militia and 5,000 for the permanent force. Actually, the numbers are somewhat below these figures as follows: Infantry, 43,162 officers and men; field artillery, 3,719; garrison artillery, 2,993; cavalry, 8,567, a total of 58,441 officers and men. In addition there are in Canada reserves, under various names, to the number of 39,346. The Canadian forces are probably about as well trained as the Organized Militia of the United States.

FRANCE.

The French Army proper is known as the Metropolitan Army and is divided between France and Algiers. There are 20 army corps organized in peace. In addition there is one colonial army corps. There are 47 divisions and 92 infantry brigades; 21 field artillery brigades are distributed among the 21 corps. There are also 8 cavalry divisions organized in peace, or a total of 38 cavalry brigades.

The total peace strength of the French Army, exclusive of colonial troops but including gendarmes and "republican guards," comprises 29,209 officers and 577,303 men. Of these 26,368 officers and 507,764 men are stationed in France. There are in addition, 2,083 officers and 26,043 men of the colonial army stationed in France. This brings the total force stationed in France up to 28,451 officers and 533,807 men. The grand total of the Metropolitan Army and the colonial

(Continued on page 396.)

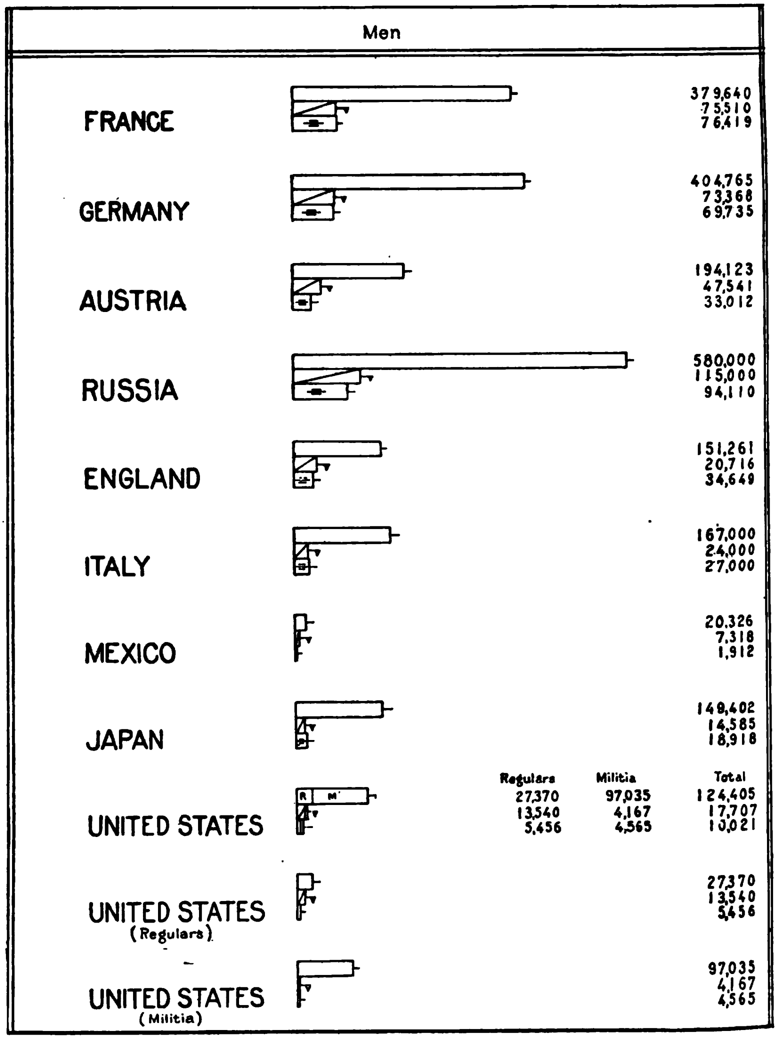
Table Showing Fighting Strength of Three Arms on Mobilization.

EXISTING ORGANIZATIONS ONLY CONSIDERED.

Country.	Infantry rifles.	Cavalry sabers.	Field guns.	Sabers per thousand infantry bayonets.	Field guns per thousand infantry bayonets.[1]	Fully trained reserves available for passing from peace to war footing.
France [2]	618,450	66,750	2,936	107.93	4.74	2,300,000
Germany	633,000	76,500	3,866	120.85	6.10	4,000,000
Austria [3]	420,300	37,800	1,854	89.93	4.41	1,600,000
Russia [4]	973,152	111,825	4,432	114.91	4.55	3,800,000
England [5]	135,020	15,000	1,170	111.09	8.66	215,000
Italy	300,000	20,880	1,470	69.99	4.90	1,250,000
Mexico [6]	53,760	14,016	176	260.71	3.27	None.
Japan [7]	228,000	14,550	954	63.81	4.18	1,000,000
UNITED STATES.						
Regulars [8]	39,600	15,225	144	384.46	3.63	None.
Organized Militia [9]	167,000	5,800	200	34.73	1.19	None.
Total[10]	206,600	21,025	344	101.76	1.66	None.

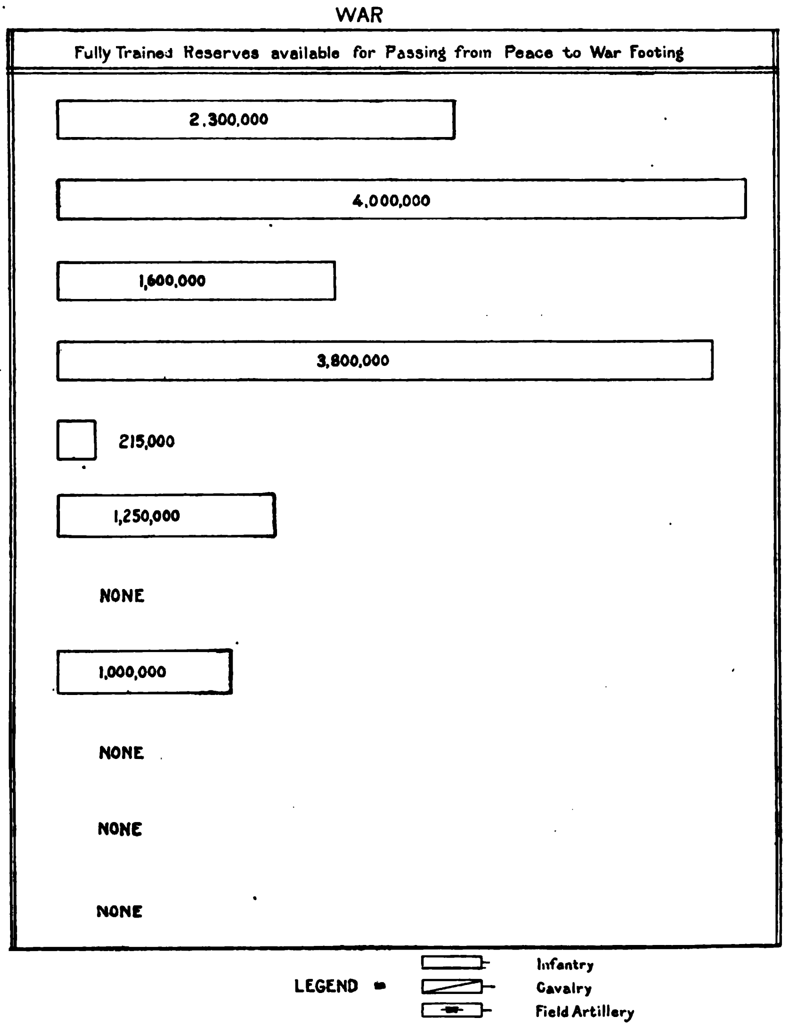
1 No deductions made for horse guns.
2 For all existing units, for mobilization in France, see separate study.
3 Common army only. Figures are approximate. (See study.)
4 The peculiar situation of Russia makes it impossible for her to assemble her total force upon any one theater of war.
5 Regulars only. For territorial forces, extra reserves, etc., see study.
6 Total strength in ranks considered. The deductions which should be made for noncombatants are not accurately known. Laws for compulsory service exist and might be put into effect in war.
7 Japan forms a very large number of new organizations which are not considered here. Neither are the special troops in Formosa and elsewhere considered. The foot artillery mobilizes an additional number of heavy field guns, possibly 1 gun per thousand rifles.
8 Porto Rican Regiment and Philippine Scouts are excluded from this table.
9 The infantry in the Organized Militia is obtained by reducing all incomplete regiments to the standard organizations. Separate companies and cadet corps, etc., have not been considered.
The Organized Militia has no complete regiments of Cavalry. The figures are obtained by multiplying the number of troops by the troop fighting strength.
All batteries of the Organized Militia are included, although 6 batteries (24 guns) have not yet reached the stage where it is deemed expedient to issue modern material. Only a few batteries are organized into complete battalions and there are no regiments.
10 This assumes that organizations can be raised to the war strength. As a matter of fact trained men are not available for this purpose, and if they were clothing and equipments are not available for passing to the war strength.

PEACE



The relative rank between the officers of the United States army and navy is as follows: General with Admiral; Lieutenant-General with Vice-Admiral; Major-General with Rear-Admiral; Brigadier-General with Commodore; Colonel with Captain; Lieutenant-Colonel with Commander; Major with Lieutenant-Commander; Captain with Lieutenant; First Lieutenant with Lieutenant (junior grade); Second Lieutenant with Ensign.

At the close of the fiscal year ending June 30, 1911, the number of sea coast guns in the United States mounted, ready for armament and under construction, were as follows. Guns mounted: 376 12-inch mortars; 105 12-inch guns, including 2 guns on hydraulic lifts; 133 10-inch guns; 65 8-inch guns; 503 rapid fire guns, one mounted temporarily. Ready for Armament: 2 12-inch guns and 13 rapid fire guns.



GUN SALUTES.

President of the United States, President of a Foreign Republic, Member of Royal Family and Ex-President of the United States, 21 guns; Vice-President of the United States and Ambassador of United States (in waters of country to which he is accredited), 19 guns; Secretary of the Navy, Cabinet Officer, Chief Justice, Governor-General of U. S. Islands, Governor of State, Territory, or U. S. Islands, President *pro tempore* of Senate, Speaker of House of Representatives, Committee of Congress, Admiral of the Navy and General, 17 guns; Assistant Secretary of the Navy, Envoy Extraordinary, Vice-Admiral and Lieutenant-General, 15 guns; Minister Resident, or Diplomatic Representative, Rear-Admiral and Major-General, United States Army, 13 guns; Charge d'Affaires and Commodore, 11 guns; Consul-General, 9 guns; Consul, 7 guns; Vice-Consul, 5 guns.

(Continued from page 393.)

troops stationed in France is 31,292 officers and 603,364 men.

The organization of the maximum mobilization of France cannot be given with any degree of accuracy but it is estimated that the sum total of all trained men which she is able to mobilize amounts to about 3,000,000 men. The fighting strength of the three arms on *initial* mobilization would be about 518,000 infantry rifles, 59,250 cavalry sabres and 2,944 field guns. This estimate is a minimum.

Besides the above, there are about 49,500 colonial troops. About 14,500 of these are Europeans and the remainder natives. There are also about 3,723 Europeans and 8,254 natives in the forces at Madagascar.

Service with the Metropolitan Army is compulsory between the ages of 20 and 45. After serving with the colors for two years (all arms) the men pass into the reserve of the active army, in which they serve for 11 years, during which they are subject to two periods of instruction, one for 23 days, the other for 17 days. From the reserve of the active army the men pass to the "territorial army," in which they serve for 6 years, subject to one period of 7 days' instruction. The final service is with the "reserve of the territorial army"; this service is for 6 years; the men receive no training but are subject to muster.

GERMANY.

The German Army as now organized in peace consists of 23 army corps and 1 cavalry division, besides certain special troops, schools, recruiting stations, etc. While the cavalry divisions which would mobilize in war are not all formed in peace, there exist certain staffs for such divisions and they are assembled for instruction from time to time.

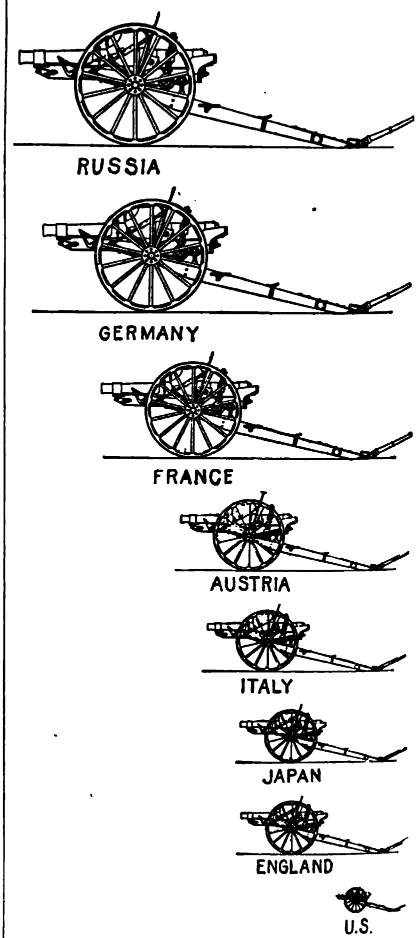
The total peace strength amounts to 622,320 officers and men. To these should be added from 10 to 12 thousand "Einjahrig-freiwilligers." These men serve for one year defraying their own expenses. The sum total of *trained* men which Germany is able to mobilize amounts to about 4,610,000. The estimated fighting strength of her *initial* mobilization is as follows: 962,000 infantry rifles; 79,200 cavalry sabres; 5,226 field guns. No German troops of the army proper serve outside the home country in time of peace. An estimate of the number of colonial troops places the number at 10,000 officers and men.

Service in the German army is compulsory between the ages of 17 and 45 and is divided into a number of categories. Service with the colors is three years with the cavalry and horse artillery and two years for other arms. After serving with the colors, the men pass into the reserve, in which they serve 4 years and 6 months or 5 years and 6 months according to the arm of the service. During this service the men of the reserve may be called out for two periods of training of 8 weeks each. In practice the majority of the reserve is seldom held longer than 28 days for each period. From the reserve the men pass into various other categories. Germany has more men annually arriving at the age of military service than she needs for duty with the colors. Somewhat over one million men annually present themselves, of whom a little more than 250,000 are actually drafted for duty with the colors.

ITALY.

The Italian military system is complicated and is composed of the regular army, the mobile militia, and the territorial militia. The regular army as reorganized in 1910 comprises 12 army corps, 25 divisions, and 3 cavalry divisions in time of peace. Commanders and staffs for four armies exist in time of peace.

The total peace strength of the regular army in 1909-1910 was 13,942 officers and 274,467 men, but it is doubtful if more than 250,000 men were actually with the colors at any one time. On paper the number of men Italy would be able to mobilize amounts to



ARTILLERY OF PRINCIPAL NATIONS.

about 3,500,000 men. A conservative estimate would seem to be about 1,500,000 *fully trained* men. The complex system and the custom of giving indefinite leave to untrained men render it difficult to estimate Italy's strength accurately with respect to the number of fully trained men. The fighting strength of the three arms on *initial* mobilization would be: Infantry rifles, 300,000; cavalry sabres, 20,880; field guns (with probably an additional 162 heavy field guns manned by fortress artillery) 1,470. In addition, Italy maintains in her African possessions 132 officers and 4,530 trained men; of the latter 660 are Italians and the remainder natives.

Service is compulsory between the ages of 20 and 39. Service with the colors is nominally for 3 years, but as the budget is seldom sufficient many men are released with one or two years' training. These pass from the colors to a form of leave status in which they serve to complete a total period in the regular army of 8 or 9 years. They then pass into the mobile militia, from whence they go into the territorial militia. The men are subject to the call for instruction as follows: 30 days per year for the leave status and mobile militia; 30 days in 4 years for the territorial militia.

MEXICO.

There is no organization higher than the regiment in time of peace. The total peace strength is between 31,000 and 32,000. Mexico's war strength, aside from new organizations, may be reckoned at about 100,000 officers and men. In theory, service is compulsory. Actually, it is not, except, perhaps, for some of the lower and criminal classes.

JAPAN.

The rapid progress of Japan as a military nation, the secrecy maintained by her concerning reserves, territorial organizations, etc., as well as the system of training Japanese school children in the rudiments of drill and military discipline, makes it extremely difficult to make an accurate inventory of the Japanese military resources.

The division is the highest permanent organization in time of peace. There are, however, 11 generals and 22 lieutenant-generals, besides other officers, available for the command and staff of such armies as may be formed in war. There are 19 divisions organized in peace. There are 39 brigades, 4 cavalry brigades and 3 field artillery brigades. In addition there is one infantry brigade in Korea.

The peace strength of Japan is variously estimated and it is certain that it is *at least* 230,000 men. The fighting strength of the three arms follows: Infantry rifles, 228,000; cavalry sabres, 14,550; field guns (with possibly 228 heavy field guns in addition) 954. There are at least 1,000,000 *fully trained* reserves subject to call on mobilization.

RUSSIA.

It is difficult to make an entirely satisfactory résumé of the Russian Army due to the vast extent of Russia's territory, the internal condition of the nation, and the character of the countries adjoining her which make it necessary for her to maintain what amounts to three separate armies, namely, the Army of Europe and the Caucasus; the Army of Central Asia; the Army of Siberia and Eastern Asia. Then the troops are divided up into numerous categories, some of which are most unusual and about which there is little information that can be depended upon. For example, we find "active troops," "reserve troops," "2d reserve troops," and "fortress troops."

There are 31 army corps, with 56 divisions organized in peace, and 23 cavalry divisions. The total peace strength amounts to about 1,200,000 officers and men. The total number of trained men subject to call amounts to about 5,000,000. It is estimated that Russia could mobilize 2,000,000 *fully trained* men upon her European frontiers.

Military service in Russia is obligatory. Passing from service with the colors the men pass into various reserves but on account of their great variety no further statements can be given in a brief form.

THE UNITED STATES ARMY.

The United States Army consists, ordinarily, of the Regular Army but whenever the United States is invaded or is in danger of invasion from any foreign nation, or of rebellion against the authority of the Government of the United States, or the President is unable with the regular forces at his command to execute the laws of the Union, he may call into the military service of the United States, all or any part of the Organized Militia of the various States and the District of Columbia. In war, or when war is imminent, the Army of the United States, after the Organized Militia has been called into service, may be further augmented by the employment of volunteers.

Under the Act of Congress approved Feb. 14, 1908, the system of military control in the Army was reorganized. This act abolished the separate office of commanding general of the army and created the General Staff Corps, which under the direction of the Chief of Staff, is charged with the following duties: To investigate and report on all questions affecting the efficiency of the Army and its state of preparation for military operations; to prepare projects for maneuvers; revises estimates for appropriations for the support of the Army and advises as to the disbursement of such appropriations; exercises supervision over inspections, military education and instruction, etc. and to perform such other military duties not otherwise assigned by law, as may from time to time be prescribed by the President.

On May 26, 1911, a general order of the War Department was issued by which the office of Chief of Staff was divided into four sections. 1. The Mobile Army. 2. The Coast Artillery Division. 3. The Division of Militia Affairs. 4. The Army War College.

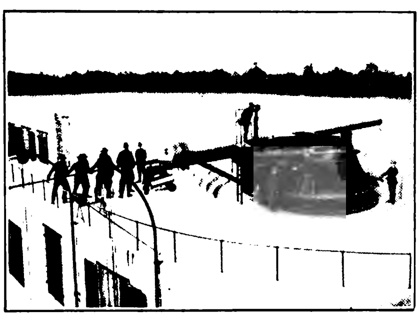
The command of the Army rests with the constitutional commander-in-chief, the President, who may place all or part of the Army under commands subordinate to his general command. We have had but four

generals—Washington, Grant, Sherman and Sheridan. A General is supposed to command an army. An army is a large and organized body of soldiers, generally composed of infantry, cavalry and artillery, completely armed and provided with necessary stores, etc., and the entire force is under the direction of one general. The subdivision of the United States Army follows. An "army" is divided into two or more field armies, or corps, commanded by a Lieutenant-General. A "corps" is the largest tactical unit of a large army and is really a small army complete in itself in that it is usually organized with separate staff, infantry, cavalry and artillery regiments as well as auxiliary services. A "corps" is also any body or department of an army which is not detached but has its own organization and head, as the "Corps of Engineers," the "Signal Corps," etc. A corps is composed of two or more divisions, each under the command of a Major-General. Each "division" is composed of three brigades of infantry, a regiment of cavalry and a brigade (two regiments) of field artillery. The division is the great administrative and tactical unit and forms the basis of army organization. A "brigade" consists of three regiments of infantry and is commanded by a Brigadier-General. A cavalry brigade consists of two or more cavalry regiments. When acting independently, a regiment of horse artillery is attached to a cavalry brigade. A "regiment" which is both administrative and tactical is commanded by a Colonel and is divided into 12 companies. (The regiment at Porto Rico is composed of but 8 companies.) A regiment of cavalry is composed of 12 troops and a regiment of field artillery of 6 batteries. Two or more companies form a "battalion" commanded by a Major. The battalion is a tactical unit only. A "company," which is commanded by a Captain, is both administrative and tactical. Under the present law the number of enlisted men in a company, troop, etc., varies with the station, as follows: Philippine Islands, infantry 150 men, cavalry 100 men; Hawaii and Panama Canal Zone, infantry 72 men, cavalry 70 men; all companies not stationed as above, infantry 65 men, cavalry 65 men. There are 133 men in a battery of light and mountain artillery and 150 men in a battery of horse artillery. Each company of Coast Artillery consists of 104 enlisted men and each company of engineers of 159 men.

The Regular Army is officered: 1. By Graduates of the United States Military Academy. 2. By promotion of meritorious enlisted men of the army whose fitness for advancement is determined by a competitive examination. 3. By the appointment of civilians selected from the best cadet schools of the country

The pay of officers in active service of the United States Army is as follows: Lieutenant-General, $11,000; Major-General, $8,000; Brigadier-General, $6,000; Colonel, $4,000; Lieutenant-Colonel, $3,500; Major, $3,000; Captain, $2,400; First Lieutenant, $2,000; Second Lieutenant, $1,700. Officers below the rank of Brigadier-General receive ten per cent. on the yearly pay of the grade for each term of five years' service, not to exceed 40 per cent. in all. Thus the maximum pay of the Colonel is $5,000; Lieutenant-Colonel, $4,500, etc. Further, any officer below the rank of major required to be mounted receives $150 per annum additional if he provides one suitable mount at his own expense, and $200 if he provides two mounts. Furthermore, all officers serving outside of the United States except Porto Rico and Hawaii, receive ten per cent. increase in pay while so serving. The monthly pay of a private in artillery, cavalry, infantry and signal corps is $15 for the first enlistment, $18 for the second enlistment, etc., up to $25 for the seventh enlistment.

The active strength of the army on June 30, 1912, including the Philippine Scouts, was 4,650 officers and 86,811 enlisted men, a total of 91,461 men. This total of 91,461 was made up as follows: Infantry (31 regiments), 1,540 officers and 29,138 enlisted men; cavalry (15 regiments), 747 officers and 13,645 enlisted men; field artillery (6 regiments), 243 officers and 5,328 enlisted men; coast artillery corps (170 companies), 702 officers and 17,957 enlisted men; corps of engineers (3 battalions), 188 officers and 1,822 enlisted men; signal



LOADING A DISAPPEARING GUN, WHEN IT IS IN THE DEPRESSED POSITION.

FIRING A 12-INCH DISAPPEARING GUN AT ONE OF OUR COAST BATTERIES.

corps, 46 officers and 1,212 enlisted men; 7,084 enlisted men (casuals and recruits) at depots and en route to detachments; 18 general officers; Adjutant General's, Inspector General's; Judge advocate General's, Quartermaster's, Subsistence, Pay and Ordnance Departments, Medical Corps, Instructors at Military Academy, etc., 986 officers and 4,608 enlisted men; cadets at Military Academy, 481 (see Military Academy); 56 Indian Scouts; Phillippine Scouts, 180 officers and 5,480 enlisted men. The 413 officers and 3,496 enlisted men in the Medical Corps is not counted as part of the enlisted strength of the Regular Army, although they are included in the above rating. There were on the retired list 1,017 officers and 3,424 enlisted men.

The term of enlistment in the regular service is three years. Any male citizen of the United States between the ages of 21 and 35 may be enlisted. Minors between the ages of 18 and 21 may be enlisted only with the consent of parents or guardians. All applicants must be able to read and write English, must be able-bodied, free from disease and of good character and temperate habits.

Under the Act of Congress of January 31, 1903, amended May 27, 1908, the militia consists of every able-bodied male citizen of the United States who is more than eighteen and less than forty-five years of age, and is divided into two classes—the organized militia or National Guard, and the remainder to be known as the reserve militia. It is entirely optional whether eligible citizens join the National Guard, but it is safe to say that this body of reserves is recruited from the best and most patriotic element of the population of the United States. Congress makes an appropriation each year for the support of the militia in the various States, and the States also contribute, hold and build armories, as the regiments are really intended to defend their own State primarily, although in time of war they furnish an excellently drilled body of volunteers. In nearly every city of any great size there is one or more armories, and in the smaller cities and towns there are separate companies which have armories or drill halls. The militia in each state is divided into brigades, regiments, battalions and companies. Under the act of Congress above named the President of the United States has the power to call upon any of the military organizations of the States for national defense and when so called each man must yield prompt obedience to the order to escape trial by court-martial. The Organized Militia is, in short, subject to be ordered at any time into the service of the United States as a re-enforcement of the regular army and when so ordered are subject to the same rules and regulations as the regulars and receive the same pay, during service, as the regular army troops.

The strength of the organized militia, according to the latest report is 9,172 officers and 108,816 enlisted men, as follows: General officers and General Staff 2,051; engineers, 1,141 officers and men; cavalry, 4,226 officers and men; field artillery, 4,456; coast artillery, 7,100 officers and men; infantry, 95,356 officers and men; hospital corps, 2,281 officers and men; signal corps, 1,380 officers and men; grand aggregate, 117,988 officers and men.

The officers of higher grades are appointed by the Governor but the other officers, from Colonel down, are generally selected by ballot by the troops themselves.

The term of enlistment varies in different States from one to five years but in most States it is three years. In addition the term of re-enlistment also varies; some States provide for a certain term for the first enlistment and a smaller term of enlistment in subsequent enlistments.

The total number of males of militia age in the United States in 1910 was 20,473,684. The officers of all the volunteer forces which may be organized under the authority of Congress are selected from the following classes of persons: 1. Those who have served in the Regular Army. 2. Those who have served in any volunteer forces of the Organized Militia. 3. Those who have attended a military school or college.

CIVIL WAR STATISTICS.

The total number of enlistments in the army, navy and marine corps, during the Civil War, totaled 2,778,304 as follows: White troops of army, 2,493,366; sailors and marines, 105,963; negro troops, 178,975. Many men enlisted two or three times and are counted that number of times in the above rating. New York had 404,805 white troops, 4,125 negro troops and 39,920 sailors and marines; Pennsylvania had 315,017 whites, 8,612 negroes and 14,307 sailors and marines; Ohio had 304,814 whites, 5,092 negroes and 3,274 sailors and marines; Illinois had 255,057 whites, 1,811 negroes and 2,224 sailors and marines; Massachusetts had 122,781 whites, 3,966 negroes and 19,983 sailors and marines. Kentucky had the greatest number of negro troops, 23,703.

During the Civil War there were 4,142 officers and 62,916 enlisted men killed in action; 2,223 officers and 40,789 enlisted men who died of wounds received in action; 2,795 officers and 221,791 enlisted men died of disease; 106 officers and 4,838 enlisted men drowned; other known causes 290 officers and 7,472 enlisted men; causes not stated, 28 officers and 12,093 enlisted men, making a grand total of 9,584 officers and 349,944 enlisted men killed during the Civil War.

At the close of the fiscal year ending June 30, 1912, there were 165 garrisoned posts in continental United States, Alaska, Hawaii Islands and Porto Rico. United States: 103 forts, 28 sub-posts of forts, 10 barracks, 5 arsenals, 2 military prisons (Alcatraz, Cal. and Ft. Leavenworth, Kans.), 3 general hospitals and the Springfield Armory. There were also 4 forts in Alaska: the Henry Barracks and the post at San Juan, Porto Rico; and the post at Panama Canal Zone; Hawaiian Islands; 3 fort barracks and 2 sub-posts of forts.

THE SINEWS OF WAR.

Ten days' rations of the American Army compared with a locomotive and one of the 70,000 units that consume this enormous quantity of food. Only one of the meats or fish shown enter into the calculation, the rest represent the variety from which the soldier can make his choice.

THE UNITED STATES MILITARY ACADEMY.

Appointments: Each congressional district and Territory—the District of Columbia and also Porto Rico—is entitled to have one cadet at the academy. Each State is also entitled to have two cadets from the State at large, and 40 are allowed from the United States at large. The law, however, provides that for six years, from July 1, 1910, whenever any cadet shall have finished three years of his course at the academy his successor may be admitted. The appointment from a congressional district is made upon the recommendation of the Representative in Congress from that district, and those from a state at large upon the recommendation of the Senators of the State. Similarly the appointment from a Territory is made upon recommendation of the Delegate in Congress and that from the District of Columbia upon the recommendation of the Commissioners of the District. Each person appointed must be an actual resident of the State, District, or Territory from which the appointment is made. The appointments from the United States at large are made by the President of the United States. Appointments are required by law to be made one year in advance of the date of admission, except in cases where by reason of death or other cause, a vacancy occurs which cannot be provided for by such appointment in advance. These vacancies are filled in time for the next examination. Two alternates are usually named for each candidate nominated and the alternate making the highest average is entitled to admission in case of the failure of the candidate.

Examinations: Examinations are held on the last Tuesday in April of each year before a board of army officers to be convened at such places as the War Department may designate. Candidates must appear for the physical and mental examination before such board.

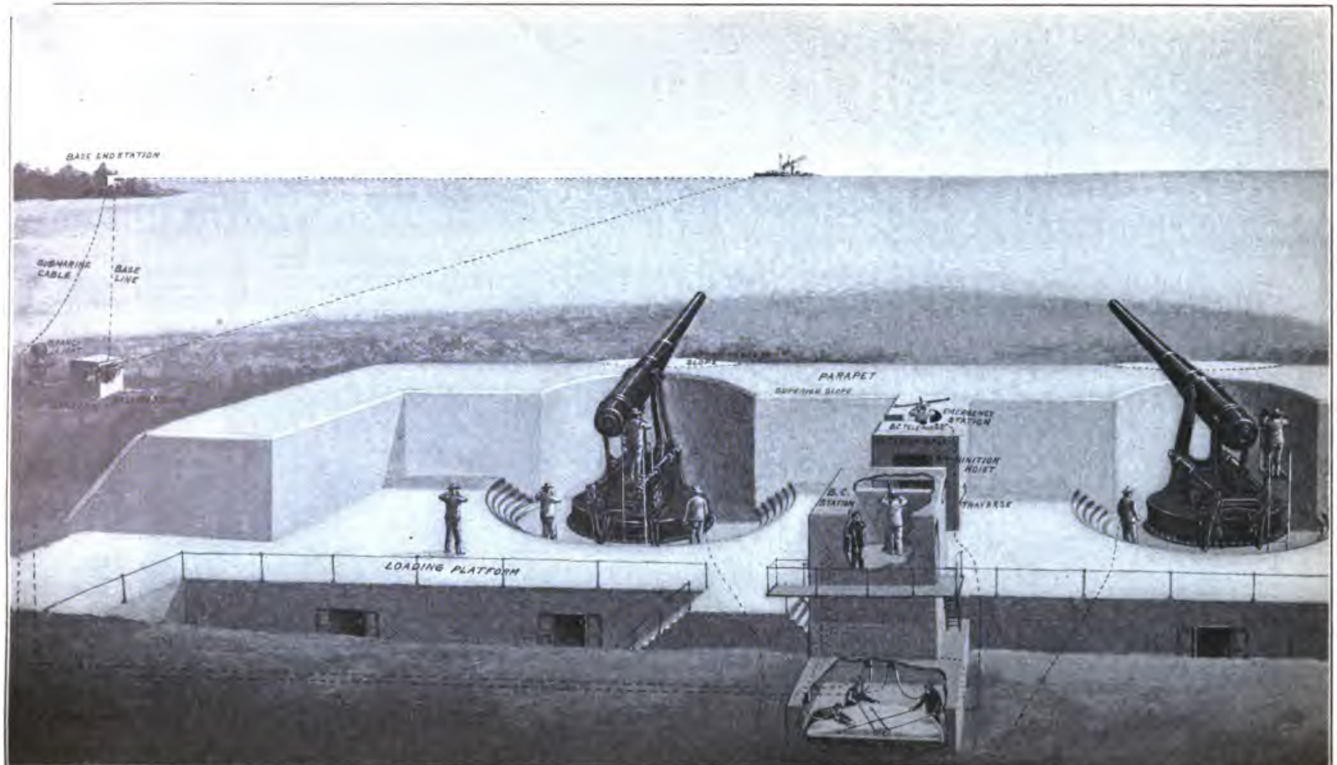
No candidate is admitted who is under 17 or over 22 years of age or less than 5′ 4″ in height at the age of 17, 5′ 5″ at the age of 18 and upward, or who is deformed, or afflicted with any disease or infirmity which would render him unfit for military service.

Pay: The pay of a cadet is $600 per year and one ration per day, the total being $709.50. No cadet is permitted to receive money or any other supplies from home without the sanction of the superintendent.

After graduation a cadet may be promoted and commissioned to the grade of second lieutenant in any arm or corps of the Army in which there may be a vacancy and if there is no vacancy he may be commissioned as an additional second lieutenant, with the nominal pay of a second lieutenant, until a vacancy occurs.

THE NEW ARMY GUN FOR AIR-CRAFT.

RANGE FINDING TOWER.



TYPICAL VIEW OF A COAST-DEFENSE BATTERY.

Observers at Stations B[1] and B[2], which may be a mile or more apart, note the angles made by the lines to enemy's ship and the base line. These angles are telephoned to the plotting room, where the exact position of the ship and the corresponding elevation for the guns are determined. This elevation corrected for wind, tide, etc., is telephoned to the guns.

THE MONROE DOCTRINE.

The Monroe Doctrine was formulated by President Monroe in 1823, in agreement with Great Britain and in opposition to the designs of the Holy Alliance, which contemplated the partition of South America among the European Powers. President Monroe said: "In the discussions to which this interest has given rise, and in the arrangements by which they may terminate, the occasion has been judged proper for asserting as a principle in which the rights and interests of the United States are involved, that the American continents, by the free and independent condition which they have assumed and maintain, are henceforth not to be considered as subjects for future colonization by European Powers. * * * We owe it, therefore, to candor and to the amicable relations existing between the United States and those powers to declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies or dependencies of any European Power we have not interfered and shall not interfere. But with the governments who have declared their independence and maintain it, and whose independence we have on great consideration and on just principles acknowledged, we could not view any interposition for the purpose of oppressing them or controlling in any other manner their destiny, by any European power, in any other light than as the manifestation of an unfriendly disposition toward the United States.

THE MORTAR ON ITS CARRIAGE HAULED BY AN AUTOMOBILE.
THE LATTER CARRIES THE AMMUNITION.

DEPARTMENT OF WAR.

The Secretary of War is the head of the War Department and exercises personal supervision of all business relating to the military service. He performs such duties as are required of him by law or may be enjoined upon him by the President, and directs the management of all the bureaus, divisions and officers embraced in the department. Has supervision of the United States Military Academy at West Point and of military education in the Army.

The principal duties of the General Staff Corps are given under the United States Army, page 397.

DIVISION OF MILITIA AFFAIRS.

The Division of Militia Affairs is vested with the transaction of business pertaining to the organized and unorganized militia of the United States, its jurisdiction embracing all administrative duties involving the armament, equipment, discipline, training, education and organization of the militia.

MILITARY BUREAUS.

The Adjutant General is charged with the duty of recording, authenticating, and communicating to troops and individuals in the military service all orders, instructions, and regulations issued by the Secretary of War; of managing the recruiting service; pension and other business connected with the Volunteer Armies.

The Inspector-General inspects all military commands and stations, schools, fortifications, arsenals, armories, etc., under charge of or carried on by officers of the Army.

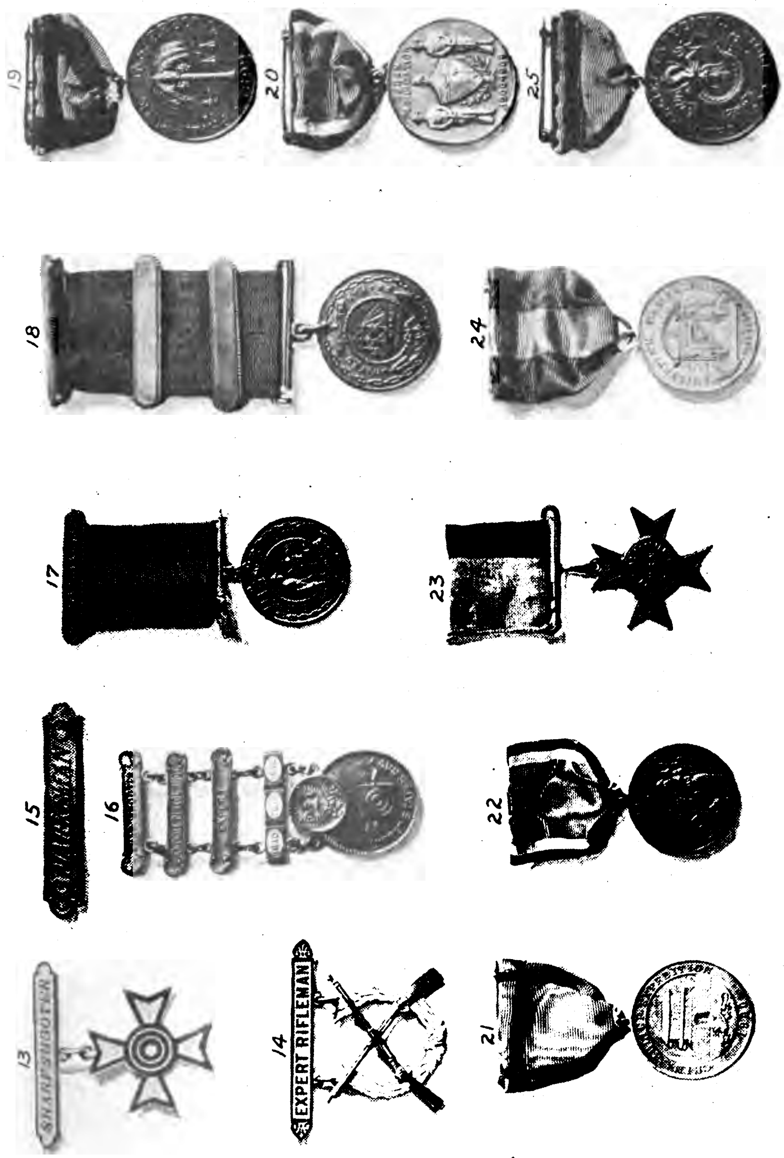
The Quartermaster-General provides transportation for the Army; also clothing and equipage, horses, mules, etc., for the Army and militia; pays guides, spies and interpreters; is in charge of national cemeteries.

The Corps of Engineers is charged with duties relating to the construction and repair of fortifications, works of defense, military roads and bridges, etc.

The Ordnance Department provides, preserves, distributes, and accounts for every description of artillery, small arms and all the munitions of war which may be required for the fortresses of the country, the armies in the field, and the whole body of militia.

The Chief Signal Corps Officer is charged with the supervision of all military signal duties, including telegraph and telephone apparatus and the necessary meteorological instruments for use on target ranges and other military uses, and all other duties pertaining to military signaling, including aeroplanes.

THE MEDALS OF THE ARMY AND NAVY.



THE MEDALS OF THE ARMY AND NAVY.

THE MEDALS OF THE ARMY AND NAVY.

MEDALS OF HONOR.

The Medal of Honor for the Navy (No. 2), which was made available by the Act of Congress, approved December 21, 1861, is bestowed upon such petty officers, seamen, landsmen and marines as should distinguish themselves by their gallantry in action or other seamanlike qualities, during war. It consists of a bronze five-pointed star, the points terminating in trefoil with a wreath of oak and laurel contained in each ray. In the center, within a circle of thirty-four stars, America is represented as Minerva vanquishing Discord. The star is mounted on an anchor and suspended from a silk ribbon of red and white stripes, arranged vertically below a field of blue.

The Medal of Honor for the Army (No. 9) is made in silver, heavily electro-plated in gold. It consists of a five-pointed star and in the center appears the head of Minerva. Surrounding this central feature, arranged in circular form, are the words "United States of America," representing nationality. The medal is suspended by a light blue watered-silk ribbon spangled with thirteen white stars representing the original States, and is attached to an eagle clasp supported on a horizontal bar, upon which appears the word "Valor."

GOOD CONDUCT MEDALS.

There are many men in the Naval Service, although they may never have attracted sufficient attention to warrant the Medal of Honor, who are well worthy of recognition by virtue of their long and faithful service; for these thoroughly efficient sailors there is also a reward known as the Good Conduct Medal. The first issue of this Medal was in 1870 (No. 23). This was recalled in 1888, and the present style adopted (No. 18). In the center of the new Medal is an old warship with the word "Constitution" beneath. This is suspended by a red ribbon.

In 1910 a Medal similar to that of the Navy was adopted by the Marine Corps for the reward of Good Conduct in the service (No. 17), except that there was a slight change made in the central figure and a change in the wording to suit this corps.

BADGES FOR PROFICIENCY IN SMALL ARMS PRACTICE.

For proficiency in the annual practice with rifles and revolvers the Army and Marine Corps award a similar set of distinguishing badges. In rifle practice the first badge is that of Marksman (No. 15), which requires the qualifying of the participant with 60 per cent., for slow, rapid and skirmish fire at 200, 300, 500 and 600 yards. The Sharpshooter's Badge (No. 13) is presented to those who qualify with a similar percentage at 800 and 1,000 yards (slow fire) and rapid fire at 500 yards. For the Expert Rifleman's Badge (No. 14) the candidate must secure 68 per cent. at slow, timed and skirmish fire at 200, 300, 600 and 1,000 yards.

In the Navy the grades are corresponding, although shorter, and include revolver practice as well. The Navy issues but one Medal (No. 16), the Sharpshooter's Medal, to which bars are attached for further distinction.

SPECIAL LEGENDS.

The Certificate of Merit Badge (No. 11); issued to officers and men of the Army for meritorious service. The ribbon is composed of two bands of red, white and blue, separated by a narrow white stripe.

The Philippine Congressional Medal (No. 5); issued to volunteer officers and men who served beyond their enlistment with the Army in the Philippines. The ribbon is composed of a broad band of blue with a narrow white stripe separating it from narrow stripes of red, white and blue on either edge.

The Civil War Campaign Badge (No. 3); issued to officers and men for service in the United States Army in the Civil War. The ribbon is composed of two bands of red, white and blue; the red on the outside and the blue stripes separated by a narrow stripe of red. (No. 10), issued to those of the Navy and Marine Corps who served during the Civil War. The ribbon is blue and gray.

The Indian Wars Campaign Badge (No. 7); issued to those who served in the Army in the campaigns against the Indians. The ribbon is bright red with a darker stripe of red on either edge.

The Spanish-American War Campaign Badge (No. 6); issued to those who served in the Army in the Spanish War, in Cuba, Porto Rico or the Philippines. The ribbon is composed of a broad band of yellow, between two bands of red, with a narrow border of blue on either edge. (No. 12), issued to officers and men of the Navy and Marine Corps who served in Cuban, Porto Rican or Philippine Waters during the Spanish War. The ribbon is yellow with two stripes of red.

The Philippine Insurrection Campaign Badge (No. 19); issued for duty with the Army in the Philippines and for service with the several expeditions against the natives. The ribbon is composed of a broad blue band between two bands of red with a narrow stripe of blue on either edge.

The China Relief Expedition Badge (No. 25); issued for service ashore in China with the Peking Relief Expedition. The ribbon is a broad band of yellow edged with blue. (No. 21), issued to those who served in the Navy and Marine Corps in Chinese Waters or ashore during the Boxer Uprising. The ribbon is yellow with a narrow black band near each edge.

The Dewey Congressional Medal (No. 1); issued to members of the Navy or Marine Corps who served with the Asiatic Squadron at Manila. The ribbon is composed of a yellow band with a blue band on either side.

The West Indies Campaign Medal (No. 4); issued for service during the West Indies Campaign in the Navy and Marine Corps. The ribbon is composed of three bands, the central one blue and the outside ones red. (No. 8), issued for specially meritorious service during the West Indies Campaign other than in battle, to officers and men of the Navy and Marine Corps. The ribbon is red.

The Philippine Campaign Badge (No. 24); issued to members of the Navy and Marine Corps who served in that campaign. The ribbon is red with a yellow band in the center.

The Cuban Pacification Badge (No. 22); issued to officers of the Navy and Marine Hospital Corps who served in Cuba. The ribbon is similar to that of the Army for this campaign (No. 20); olive drab, with red white and blue borders.

PASSPORTS.

Passports are required for entrance into Russia, Turkey and the Balkan countries, and must be visaed by diplomatic or consular representatives of those countries. There are no such representatives of the Balkan States in the United States and passports for those countries should be visaed by their diplomatic or consular representatives elsewhere. Passports may be required in other countries of persons making a prolonged stay, especially if they reside in boarding houses or rented apartments, but they are often valuable in the securing of registered mail, admissions to certain galleries, etc., which are normally closed to the public. Passports are issued by the Secretary of State. An American abroad may make his application before an American diplomatic or consular officer, who will forward it to the department. The fee for a passport is $1.00. This amount in currency or postal order should accompany each application made by a citizen of the United States. The orders should be made payable to the Disbursing Clerk of the Department of State. Drafts or checks are not accepted. A person who is entitled to receive a passport, if in the United States at the time, must make a written application in affidavit form to the Secretary of State. Application must be made by the person to whom the passport is to be issued, and signed by him, as one person cannot apply for a passport for another. The affidavit must be attested by an officer authorized to administer oaths, and an official seal must be affixed, or his official character must be authenticated by a certificate of the proper legal officer. The applicant must take the oath of allegiance to the Government of the United States. The oath is on the application blank. The application must be accompanied by a description of the applicant. Full data for these questions are provided on the blank. There are a number of different forms. There is one for a native citizen, one for the naturalized citizen, and one for a person claiming citizenship through the naturalization of husband or parent. In asking for a blank it should be specified which form is desired. A woman's application must state whether she is married or not, and a married woman must state whether her husband is a native or a naturalized citizen. A passport expires two years from the date of issue, but it may be extended for two years by a diplomatic or consular officer of the United States, if presented when it is about to expire. Applications for passports from naturalized citizens must be accompanied by a certificate of naturalization.

When the applicant is accompanied by his wife, minor children and a servant, to be entitled to receive the passport it is sufficient to state the fact, giving the respective ages of the children and the allegiance of the servant, then one passport will suffice for all. For any other person in the party a separate passport will be required. The woman's passport may include her minor children and servant under the above-named conditions. It should be noted, however, that the term "servant" does not include a governess, tutor, pupil, companion or person holding like relations to the applicant for passport. Professional or other titles will not be inserted in the passports. This information is obtained from the circular entitled, "Rules Governing the Granting and Issuing of Passports in the United States." which will be sent with the blank on application. It takes only a few days to obtain a passport. The intervention of those who make a business of securing passports is entirely unnecessary. The blank is very simple and only requires the filling out of the important details, such as the description of the applicant, the taking of the oath of allegiance before a notary public or other officer who is entitled to take similar oaths, and the application must be signed by a credible witness. Some concerns make a business of obtaining passports at a fee of from $2.00 to $5.00, but with the instructions given in this book and the rules given in the circular sent, their services are entirely unnecessary. Information revised by officials of the Department of State on May 13, 1912.

WORDING OF PASSPORT.

Good only for two years from date.

(Coat of Arms).

UNITED STATES OF AMERICA.
Department of State.

To all to whom these presents shall come, Greeting: I, the undersigned, Secretary of State of the United States of America, hereby request all whom it may concern to permit

....

a Citizen of the United States ——————

.... Safely..

and freely to pass and in case of need to give ....all lawful Aid and Protection.

(SEAL of the Department of State.)

Given under my hand and the Seal of the Department of State, at the City of Washington, the ....day of ....in the year 1910, and of the Independence of the United States the one hundred and thirty-fourth.

(Signature of the Secretary of State.)

Description,

Age..............Years...................
Stature........Feet.........Inches Eng.
Forehead................................
Eyes....................................
Nose....................................
Mouth...................................
Chin....................................
Hair....................................
Complexion..............................
Face....................................

Signature of the Bearer.

....
No...........

Note.—The Department of State has refused to grant permission to reproduce a real Passport, hence this rather insufficient substitute.

THE NOBEL PRIZES.

The Nobel Foundation is based upon the last will and testament of Dr. Alfred Bernhard Nobel, engineer and inventor of dynamite, dated December 27, 1895, the stipulations of which, respecting this fund, are as follows:

"The rest of my fortune, that is, the capital realized by my executors, is to constitute a fund, the interest of which is to be distributed annually as a prize to those who have in the course of the previous year rendered the greatest services to humanity. The amount is to be divided into five equal parts, one of which is to be awarded to the person who has made the most important discovery in the domain of physical science; another to the one who has made the most valuable discovery in chemistry or brought about the greatest improvement; the third to the author of the most important discovery in the field of physiology or medicine; the fourth to the one who has produced the most remarkable literary work of an idealistic tendency, and finally the fifth to the person who has done the best or the most in the cause of the fraternity of nations, for the suppression or the reduction of standing armies as well as for the formation and propagation of peace congresses. The prizes will be awarded for physics and chemistry by the Swedish Academy of Sciences; for works in physiology and medicine by the Caroline Institute of Stockholm; for literature by the Stockholm Academy, and finally for the service in the cause of peace by a committee of five members of the Norwegian Storthing. It is my express desire that the benefits of the foundation are to be open to all nationalities and sexes and that the prize be awarded to the one most worthy, whether Scandinavian or not."

Each prize amounts to about $40,000, and the corporation designates a "Comité Nobel" composed of three or five members for each section, with headquarters at Christiana, Norway.

As expressed in the will no consideration is paid to the nationality of the candidate, but it is essential that every candidate shall be proposed in writing by some qualified representative of science, literature, etc., in the chief countries of the civilized world, such proposals to reach the Committee before the first of February in each year, the awards being made on the following 10th of December, the anniversary of Mr. Nobel's death.

The first distribution of prizes took place in 1901 and including the awards of 1912 only three prizes have been awarded to Americans: 1906, Prof. A. A. Michelson, Physics; 1906, Theodore Roosevelt, Peace; 1912, Dr. Alexis Carrel, Medicine. The following awards were made in 1912: Physics, Gustav Dalen, Swede; Medicine, Dr. Alexis Carrel, American; Chemistry, Prof. Grignard and Prof. Sabatier, French; Literature, Gerhart Hauptmann, German; Peace, No award.

THE HALL OF FAME.

"The Hall of Fame for Great Americans" is the name of an open colonnade attached to the Library of the University of the City of New York, on University Heights in New York city, Borough of the Bronx, in which are inscribed on bronze tablets the names of famous American men and women. Nominations for the honor are made by the public and are submitted to a committee of 100 eminent citizens. In the case of men fifty-one votes are required and in the case of women forty-seven. The first balloting took place in October, 1900, when the following were chosen:

George Washington.	Joseph Story.	William E. Channing.	Emma Willard.
Abraham Lincoln.	John Adams.	Gilbert Stuart.	Maria Mitchell.
Daniel Webster.	Washington Irving.	Asa Gray.	Chosen in 1910.
Benjamin Franklin.	Jonathan Edwards.	Chosen in 1905.	Harriet Beecher Stowe.
Ulysses S. Grant.	Samuel F. B. Morse.	John Quincy Adams.	Oliver Wendell Holmes.
John Marshall.	David G. Farragut.	James Russell Lowell.	Edgar Allan Poe.
Thomas Jefferson.	Henry Clay.	William T. Sherman.	Roger Williams.
Ralph W. Emerson.	Nathaniel Hawthorne.	James Madison.	James Fenimore Cooper.
H. W. Longfellow.	George Peabody.	John G. Whittier.	Phillips Brooks.
Robert Fulton.	Robert E. Lee.	Alexander Hamilton.	William Cullen Bryant.
Horace Mann.	Peter Cooper.	Louis Agassiz.	Frances E. Willard.
Henry W. Beecher.	Eli Whitney.	John Paul Jones.	Andrew Jackson.
James Kent.	John J. Audubon.	Mary Lyon.	George Bancroft.
			John Lothrop Motley.

SALARIES OF OFFICIALS OF THE FEDERAL GOVERNMENT.

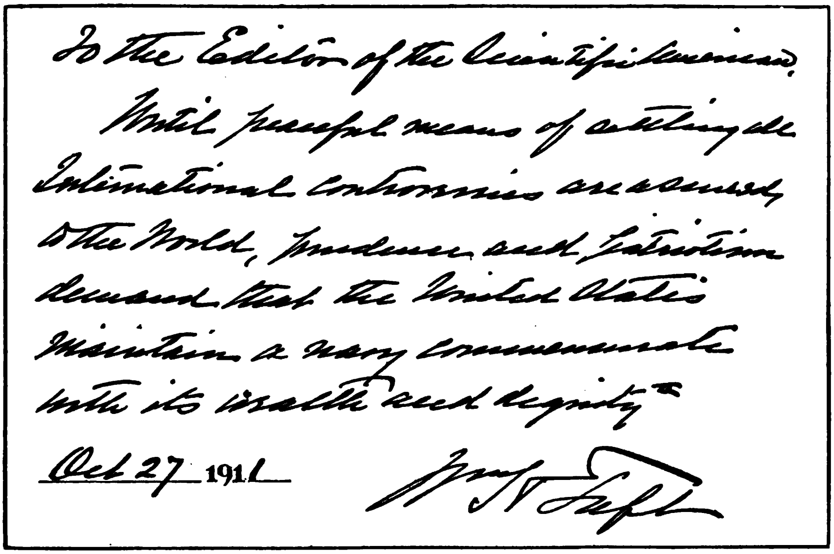
The Executive: President, $75,000; Vice-President, $12,000; Cabinet Officers, $12,000; Assistant Secretaries, $5,000, including Assistant Secretary of Navy,. Treasury Department: Treasurer of United States, $8,000; Comptroller of Treasury, $6,000; Commissioner of Internal Revenue, $6,000; War Department: Chief of Staff, $8,000; Adjutant General, $6,000; Inspector, Judge Advocate, Quartermaster, Commissary, Surgeon and Paymaster-Generals, $6,000; Navy Department: President General Navy Board, $13,500; President Naval Examination Board, $8,000; Post-Office Department: Assistant Postmaster Generals, $5,000; Interior Department: Commissioner of Education, Land Office, Pensions, Indian Affairs and Patents, $5,000; Department of Justice: Assistant Attorney Generals, $5,000. Department Agriculture: Chief, Weather Bureau, $6,000; Chief Forest Service, $5,000; Department of Commerce and Labor: Commissioner Corporations, Labor, Light-House Bureau and General Immigration, $5,000; Director of Census, $6,000; Commissioner Fisheries, $6,000. The members of the Interstate Commerce Commission receive $10,000.

The Legislative: Senators and Representatives in Congress receive $7,500, and 20 cents per mile to and from seat of Government.

The Judiciary: The Chief Justice of the United States receives $15,000; Associate Justices, $14,500.

CHAPTER XV.

NAVIES OF THE WORLD.



To the Editor of the Scientific American:

Until peaceful means of settling all International controversies are assured to the World, prudence and patriotism demand that the United States maintain a navy commensurate with its wealth and dignity.

Oct 27 1911 Wm H Taft

LETTER FROM PRESIDENT TAFT, COMMANDER-IN-CHIEF OF THE UNITED STATES NAVY.

THE NEW "EYES" OF THE MAN BEHIND THE MAN BEHIND THE GUN.

Aeronautics has developed in such a remarkable manner in the last few years that it is impossible to surmise when or where progress will be arrested. At the present time the aeroplane can be used to extend the range of vision of the fleet, but when operating beyond the sight of its base, parent ship, or landmarks, it is hampered for scouting purposes by lack of navigational facilities for the determination of course and position. It is very probable that these will come, and with them also come a vast increase in the value of the aeroplane as a naval scout. As a station from which to observe and correct the fall of shot the aeroplane will be of service, particularly where long range, indirect, high-angle firing is used as in case of a bombardment. Here, however, the question of communication is seriously involved, as much depends on the prompt and accurate transmission of information. Steady progress is being made in the development of wireless which gives promise of meeting all the requirements of the situation, and which will insure the efficiency of the aeroplane for the purposes of spotting, as above outlined. The hydræroplane, which is an American development, and which may be launched from a vessel, and alight in the water alongside on the return from a trip aloft, further increases the possibility of the aeroplane as a naval adjunct.—Thomas T. Craven, Lieutenant Commander, U. S. N. Director of Target Practice and Engineering Competitions. (Page 414.)

SEA STRENGTH.

SHIPS.

TABLE I.—VESSELS BUILT.

	Battleships, Dreadnought type.[1]	Battleships.[2]	Battle cruisers.[3]	Armored cruisers.	Cruisers.[4]	Destroyers.	Torpedo boats.	Submarines.	Coast defense vessels.[5]
England	16	40	8	34	[6] 74	[6] 144	49	70	0
Germany	11	20	3	9	39	118	9	26	3
United States	8	24	0	11	15	42	19	23	4
France	0	20	0	20	10	78	157	75	2
Japan	2	13	0	13	14	58	54	13	2
Russia	0	8	0	6	9	98	14	31	2
Italy	1	8	0	9	5	24	48	18	0
Austria	2	6	0	3	4	12	40	6	6

[1] Battleships having a main battery of all big guns (11 inches or more in caliber).

[2] Battleships of (about) 10,000 tons or more displacement, and having more than one caliber in the main battery.

[3] Armored cruisers having guns of largest caliber in main battery and capable of taking their place in line of battle with the battleships. They have an increase of speed at the expense of carrying fewer guns in main battery, and a decrease in armor protection.

[4] Includes all unarmored cruising vessels above 1,500 tons displacement.

[5] Includes smaller battleships and monitors. No more vessels of this class are being proposed or built by the great powers.

[6] Includes vessels of colonies.

TABLE II.—VESSELS BUILDING OR AUTHORIZED.

	Battleships, Dreadnought type.	Battle cruisers.	Cruisers.	Destroyers.	Torpedo boats.	Submarines.
England [1]	11	[2] 2	[2] 14	[2] 40	0	[2] 16
Germany [3]	6	3	4	12	0	[4] 6
United States	5	0	0	14	0	23
France	7	0	0	8	0	20
Japan [5]	1	4	0	2	0	2
Russia [6]	7	4	2	9	0	8
Italy	7	0	2	11	21	2
Austria	2	0	3	6	12	7

[1] England has no continuing shipbuilding policy, but usually lays down each year 4 or 5 armored ships with a proportional number of smaller vessels.

[2] Includes vessels of colonies.

[3] Germany has a continuing shipbuilding program, governed by a fleet law authorized by the Reichstag. For 1913 there are authorized 2 battleships, 1 battle cruiser, 2 cruisers, 12 destroyers. Eventual strength to consist of 41 battleships, 20 armored cruisers, 40 cruisers, 144 destroyers, 72 submarines.

[4] $4,760,000 authorized for experiments and further construction.

[5] $78,837,569 authorized to be expended from 1911 to 1917 for the construction of war vessels.

[6] Russian shipbuilding program provides for the completion by 1918 of 4 battle cruisers, 8 small cruisers, 36 destroyers, and 18 submarines. Four battle cruisers and two cruisers have been contracted for and are included in the above table.

UNITED STATES NAVAL ENLISTMENT

The term of enlistment of all enlisted men in the Navy is four years, except for minors under eighteen, who enlist with the consent of parents or guardian. Minors over the age of eighteen may be enlisted without the consent of parents or guardian, but must furnish written statement as to their age. Every person must pass the physical examination prescribed in the medical instructions. Only American citizens of good character who may reasonably be expected to remain in the service are enlisted, and every applicant must be able to read and write English and must take the oath of allegiance. No person under the age of seventeen can be enlisted.

PERSONNEL.

TABLE III.

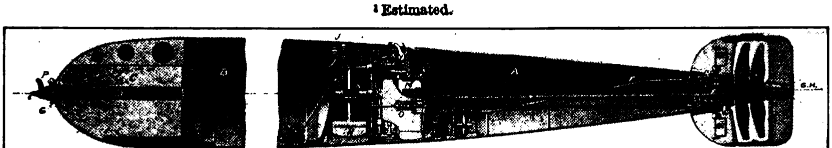
Rank.	England.	France.	Germany.	Japan.	United States.
Admirals of the fleet	3	....	2	1	[1] 1
Admirals	12	....	5	7	....
Vice admirals	22	15	12	17	....
Rear admirals	55	30	21	45	[2] 26
Captains and commanders	644	360	351	292	211
Other line officers	2,473	1,467	1,811	1,818	1,553
Midshipmen at sea	558	60	398	154	0
Engineer officers	872	505	529	683	....
Medical officers	593	[3] 390	322	[4] 368	347
Pay officers	685	211	259	341	231
Chaplains	139	....	28	....	24
Warrant officers	2,675	[5] 2,445	2,615	1,520	856
Enlisted men	115,079	55,760	60,920	42,043	48,816
Marine officers	457	....	170	....	316
Enlisted men (marines)	[6] 20,943	....	[7] 5,826	....	9,866
Total	145,210	61,243	73,269	47,289	62,247

[1] The Admiral of the Navy.
[2] The United States now has, temporarily, as extra numbers, due to promotion for war service, and to officers restricted by law to engineering duty only on shore only 5 flag officers, 20 captains, 9 commanders, 6 lieutenant commanders, and 1 lieutenant.
[3] Includes pharmacists and apothecaries.
[4] Includes pharmaceutical officers.
[5] Includes adjutants, premier maitres, and maitres of all branches.
[6] Includes 3,130 men of the Coast Guard.
[7] Marine infantry and seaman artillery.

RELATIVE ORDER OF WARSHIP TONNAGE.

Present order (tonnage completed).		As would be the case if vessels now building were completed.	
Nation.	**Tonnage.**	**Nation.**	**Tonnage.**[1]
Great Britain	2,007,247	Great Britain	2,483,545
Germany	865,984	Germany	1,133,878
United States	763,132	United States	929,351
France	627,787	France	807,717
Japan	471,962	Japan	616,528
Russia	286,930	Russia	595,807
Italy	224,837	Italy	413,882
Austria	198,159	Austria	260,751

[1] Estimated.



A PRESENT DAY MODIFIED WHITEHEAD TORPEDO. (Page 424.)

THE IMPORTANCE OF THE COMMAND OF THE SEA.

By Alfred T. Mahan

Rear Admiral, U. S. N. (Retired).

The existing contest between Italy and Turkey, confined as it is to the sea and to the possession of Tripoli, has a double interest. It illustrates on the one hand the gradual, yet perpetual, process by which a higher civilization impinges upon a lower; that is, upon one that is lower in virile efficiency, however in some instances it may have been higher in acquired material comfort, or even in literary and artistic achievement. This tendency can neither be regulated by law, nor brought to the bar of law, without injury to the progress of the world toward better universal conditions, to which end it is essential that the efficient supplant the inefficient. On the other hand this collision illustrates the importance of the command of the sea. This also, it should be noted, has been incidental and determinative in the progress of the world. Through having this command, Italy thus far has been able to localize the land fighting in Tripoli, and probably can continue to do so; to the great relief of her own resources, and that of a watching and anxious Europe.

It is to this second consideration that I am here limited by my subject—"The Importance of the Command of the Sea"—with a somewhat special reference to that importance as touching the United States. The United States in her turn, after having achieved national efficiency, by the quenching of internal discord in a bitter and bloody contest, has found herself compelled inevitably into the same path of seeming aggression upon less efficient social and political communities; to bear her part of "the white man's burden," as it has been styled. For in essence this process is not one of aggrandizement, but of responsibility; responsibility not to law, which always lags behind conditions, but to moral obligation entailed by the particular circumstances of the moment of action.

This moral side of the question is not irrelevant to the military one of the importance of commanding the sea; for granting the end—the moral obligation—the means, if not themselves immoral, follow as a matter of course. Of such means, command of the sea is one. Napoleon said that *morale* dominates war; and it is correspondingly true that a sense of right powerfully reinforces the stability of national attitude and the steadfastness of national purpose. If we have been right, morally, step by step, in the forward march of the past few years, we are morally bound to sustain the position attained, by measures which will provide the necessary means. Of these an adequate navy is among the first; probably, in our case, the chief of all.

Here, as always, it is necessary to recur to experience—to the past—in order to comprehend the present and to project the future. Why do English innate political conceptions of popular representative government, of the balance of law and liberty, prevail in North America from the Arctic Circle to the Gulf of Mexico, from the Atlantic to the Pacific? Because the command of the sea at the decisive era belonged to Great Britain. In India and Egypt, administrative efficiency has taken the place of a welter of tyranny, feudal struggle, and bloodshed, achieving thereby the comparative welfare of the once harried populations. What underlies this administrative efficiency? The British navy, assuring in the first instance British control instead of French and thereafter communication with the home country, whence the local power without which administration everywhere is futile. What, at the moment the Monroe Doctrine was proclaimed, insured beyond peradventure the immunity from foreign oppression of the Spanish-American colonies in their struggle for independence? The command of the sea by Great Britain. backed by the feeble navy but imposing strategic situation of the United States, with her swarm of potential commerce-destroyers, which a decade

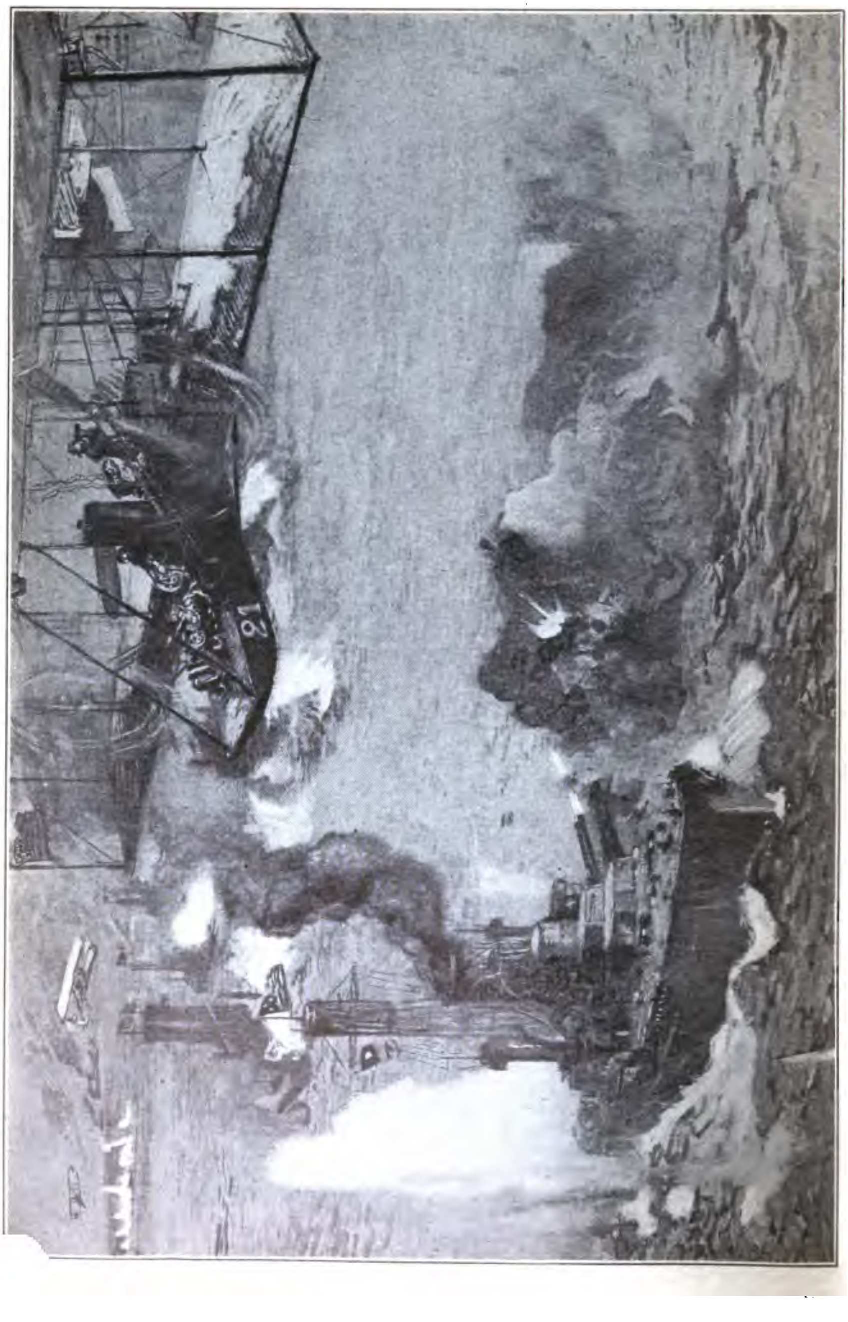
before had harassed the trade of even the mistress of the seas.

Less conspicuously, but no less truly, to what do Algiers and Tunis, and to what eventually will Morocco, owe redemption from conditions barely, if at all, above the barbarous? To the command of the sea by the nation which already has restored the former two, to be fruitful members of the world community. That South Africa is now a united commonwealth, instead of two opposing communities, such as the North and South of our own country might have been, is due to the same cause; a local preponderance of force insured by sea power. It may safely be claimed that to the navy of the United States chiefly is owing the present Union, instead of the existence of two rival nations vying, or trying to vie, with each other in military preparations, like the nations of Europe. The four years' struggle of the Confederate States might not have ended in exhaustion, had it not been for the blockade, which shut in their cotton and shut out their supplies.

Contrast this impressive exhibit, where the command of the sea has been operative, with the history and achievement of those great States which have not possessed it. Contrast Bosnia and Herzegovina for Austria, Alsace and Lorraine for Germany, with the expansion of France, Great Britain, Holland, and with that which Spain once possessed; now lost through an inefficiency, one of the first symptoms of which was the decay of her navy. The magnificent efficiency of the present German Empire strives now, against almost hopeless disadvantage, for the opportunity to exercise that efficiency outside its European limits. Opportunity was lost through the absence of naval force in the past centuries, when the maritime countries were occupying, and, in accordance with their respective political aptitudes, were determining the future of immense tracts of the world. Much time must elapse before we shall know the inside history of the still unarranged dispute with France about Morocco; but there is reason to believe that the consciousness of the British navy at the back of France has been one of the large factors in the negotiations. At least it is apparent that bitterness against Great Britain has been even more marked than against France.

The lesson for the United States is plain. In the strategic position before mentioned, in remoteness from Europe, in the rivalries of European nations, we still have a local and international advantage for preponderance in American waters; but it is not so great as to confer certainty without reasonable provision for insuring command of the sea. In the Pacific, which is equally our coast line, and to which the future mostly looks, we have no similar advantage. Much as I dislike and reject the phrase "supremacy in the Pacific," it is true that we there have duties which in case of disputes will require the presence of naval force adequate to command. Duty to the mutual support of our two chief coasts dictates full control of the Panama Canal, which from the military standpoint is the key to any broadly planned system of preparation for national defense.

But obligation is no less on account of the Philippine Islands. Having assumed control of these under imperative circumstances, we are bound in honor to support an undertaking, our fitness for which is attested by results. To them we are responsible for the maintenance of conditions under which material prosperity can advance, and their dissimilar and discordant inhabitants reach a homogeneous civilization and political development which will enable them to govern themselves. To Cuba, though independent, we owe by specific guarantees of maintenance of a like internal security. These national and international functions can be discharged, certainly only by command of the sea. The Pacific, the Atlantic, and the Caribbean, with the great controlling stations, Porto Rico, Guantanamo, the Canal Zone, and Hawaii, depend upon this command, the exponent of which is the navy, and in which ships and stations are interdependent factors. To place the conclusion concretely and succinctly, the question of command of the sea is one of annual increase of the navy. This question is not "naval," in the restricted sense of the word. It is one of national policy, national security, and national obligation.



Courtesy of the "Aero Club of America Bulletin." From a painting by Henry Reuterdahl

THE NEW "EYES" OF THE MAN BEHIND THE GUN. (Page 409.)

SHIPS' DATA, U. S. NAVAL VESSELS.

(Including those authorized by act of Congress approved Aug. 22, 1912.)

Type.	Fit for service, including those under repair.		Under construction.		Authorized.		Total.	
	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.
		Tons.		*Tons.*		*Tons.*		*Tons.*
Battleships, first line	12	205,650	6	161,000	1	[1,2] 31,400	19	398,060
Battleships, second line	19	244,146					19	244,146
Armored cruisers	10	140,080					10	140,080
Cruisers, first class	5	46,465					5	46,465
Cruisers, second class	6	33,561					6	33,561
Cruisers, third class	15	48,748					15	48,748
Monitors	10	39,004					10	39,004
Destroyers	39	23,551	11	10,496	6	6,321	56	40,368
Torpedo boats	28	4,821					28	4,821
Submarines	22	5,229	17	8,268	8	[1,2] 4,160	47	17,657
Tenders to torpedo vessels	7	20,661	1	1,408	2	[1,2] 9,900	10	31,969
Gunboats	27	25,078			3	1,805	30	26,883
Transports	5	26,595					5	26,595
Supply ships	4	25,400					4	25,400
Hospital ships	2	9,000					2	9,000
Fuel ships	19	155,663	5	95,624	2	29,000	26	[3] 280,287
Converted yachts	17	9,634					17	9,634
Tugs	44	15,884	2	2,240			46	18,124
Special type	6	26,335					6	26,335
Unserviceable for war purposes	26	59,421					26	59,421
Total	323	1,164,926	42	279,036	22	82,586	387	1,526,548

[1] Approximately. [2] Design being prepared. [3] Excepting the Justin.

PAY IN THE UNITED STATES NAVY.

The yearly pay of commissioned officers of the United States Navy is as follows: Admiral, $13,500; Rear-Admirals, first nine, $8,000; Rear-Admirals, second nine, or Commodores, $6,000; Captains, $4,000; Commanders, $3,500; Lieutenant Commanders, $3,000; Lieutenants, $2,400; Lieutenants (junior grade) $2,000; Ensigns, $1,700; Midshipmen (at Naval Academy) $600; Midshipmen (after Grad.), $1,400. All officers below the rank of Rear-Admiral are entitled to 10 per cent. increase upon the full yearly pay of their grades for each and every period of five years' service as "longevity pay" provided that the total amount of such increase shall not exceed 40 per cent. upon the full yearly pay of their grade. All officers receive 10 per cent. additional for sea duty, or shore duty beyond continental limits of the United States, except Porto Rico and Hawaii.

SHIPS' DATA, U. S. NAVAL VESSELS.

Type.	Fit for service, including those under repair.											
	1906		1907		1908		1909		1910		1911	
	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.
		Tons.		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*
First-class battleships	16	198,250	22	292,146	25	334,146	25	334,146	29	406,146	29	406,146
Second-class battleship	1	6,315	1	6,315	1	6,315	1	6,315	1	6,315	....	....
Armored cruisers	4	54,720	6	83,720	9	125,580	10	140,080	10	140,080	10	140,080
First-class cruisers	3	27,065	5	46,465	5	46,465	5	46,465	5	46,465	5	46,465
Armored ram	1	2,183	1	2,183	1	2,183	1	2,183	....	....	....	....
Single-turret monitors	4	12,900	4	12,900	4	12,900	4	12,900	4	12,900	4	12,900
Double-turret monitors	6	26,104	6	26,104	6	26,104	6	26,104	6	26,104	6	26,104
Protected cruisers	19	76,070	19	76,070	19	76,070	18	71,987	18	71,987	17	67,574
Unprotected cruisers	3	6,216	3	6,216	3	6,216	3	6,216	3	6,216	2	4,144
Scout cruisers	....	....	....	....	2	7,500	3	11,250	3	11,250	3	11,250
Gunboats	9	11,564	9	11,564	9	11,564	9	11,564	8	10,387	7	8,677
Light-draft gunboats	3	4,155	3	4,155	3	4,155	3	4,155	3	4,155	3	4,155
Composite gunboats	8	8,190	8	8,190	8	8,190	8	8,190	8	8,190	8	8,190
Training ship, sheathed	1	1,175	1	1,175	1	1,175	1	1,175	....	....	....	....
Training ships, steel	....	....	2	3,600	2	3,600	2	3,600	2	3,600	2	3,600
Training brigantine	1	346	1	346	1	346	1	346	1	346	1	346
Special class	2	2,416	2	2,416	2	2,416	2	2,416	2	2,416	2	2,416
Gunboats under 500 tons	15	3,603	13	3,265	12	3,095	12	3,095	12	3,095	9	2,439
Torpedo-boat destroyers	16	6,695	16	6,695	16	6,695	16	6,695	21	10,195	33	19,099
Steel torpedo boats	35	5,737	35	5,737	35	5,737	33	5,299	33	5,299	31	5,111
Wooden torpedo boats	1	31	1	31	1	31	1	31	1	31	....	....
Submarine torpedo boats	8	935	8	935	12	1,719	12	1,719	18	3,485	18	3,748
Iron steam vessels	5	5,861	4	3,606	3	3,056	3	3,056	3	3,056	3	3,056
Wooden steam vessels	5	8,840	5	8,840	5	8,840	5	8,840	3	5,565	3	5,565
Wooden sailing vessels	8	10,045	8	10,045	5	5,895	5	5,895	5	5,895	4	5,620
Tugs	41	13,060	40	12,703	41	13,606	42	14,361	43	[1] 15,013	44	[1] 15,713
Auxiliary cruisers	5	28,339	5	28,339	4	24,959	4	24,959	4	24,959	4	24,959
Converted yachts	23	11,881	23	11,872	22	11,750	21	11,453	19	10,421	18	10,106
Colliers	15	[2] 74,854	15	[2] 74,854	15	[2] 74,854	15	[2] 74,854	20	[2] 135,417	20	[2] 150,462
Submarine tenders	....	....	1	357	2	807	2	807	4	4,702	5	6,771
Mine-laying ship	....	....	....	....	....	....	1	4,083	1	4,083	1	4,083
Repair ship	....	....	....	....	1	3,380	1	3,380	1	3,380	1	3,380

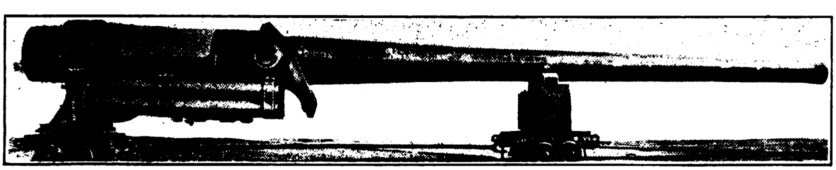
[1] Excepting Locust. [2] Excepting Justin.

SHIPS' DATA, U. S. NAVAL VESSELS.

Type.	Fit for service, including those under repair.											
	1906		1907		1908		1909		1910		1911	
	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.
		Tons.		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*
Transports and supply ships	11	53,247	10	50,571	9	50,084	8	44,384	8	44,384	8	44,384
Hospital ships	1	3,300	1	3,300	1	3,300	2	9,000	2	9,000	2	9,000
Receiving ships	4	18,995	5	21,250	5	21,250	4	18,995	4	18,995	5	23,408
Prison ships	2	[1] 4,850	2	[1] 4,850	2	[1] 4,850	3	[1] 7,105	3	[2] 4,005	3	[2] 4,005
Total	276	687,942	285	830,815	292	918,833	292	937,103	308	1,067,537	312	1,082,956

Type.	Under construction.											
	1906		1907		1908		1909		1910		1911	
	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.	Number.	Displacement.
		Tons.		*Tons.*		*Tons.*		*Tons.*		*Tons.*		*Tons.*
First-class battleships	9	135,896	5	74,000	4	72,000	6	115,650	4	95,650	6	149,650
Armored cruisers	6	85,360	4	56,360	1	14,500	...	...	...	...	...	...
First-class cruisers	2	19,400	...	...	...	...	...	...	...	...	...	...
Scout cruisers	3	11,250	3	11,250	1	3,750	...	...	...	...	...	...
Training ships, steel	2	3,600	...	...	...	...	...	...	...	...	...	...
Torpedo-boat destroyers	...	...	...	...	5	3,500	20	14,630	15	11,130	9	6,678
Submarine torpedo boats	4	784	4	784	7	2,103	16	5,890	10	4,124	17	7,732
Tugs	...	...	2	1,510	2	1,510	1	755	...	...	...	...
Colliers	...	...	2	25,170	2	25,170	6	78,220	2	38,735	2	38,735
Total	26	256,290	20	169,074	22	122,533	49	215,145	31	149,639	34	202,795

[1] Includes Southery. [2] Excepting Southery.



NEW 14-INCH GUN USED FOR ARMOR ATTACK

UNITED STATES NAVAL ORDNANCE

GUN.	MARK.	Length in Calibres.	Total Length.	Capacity of Chamber in Cubic Inches.	Travel of Projectile in Inches.	Weight of Gun.	Weight of Projectile.	Weight of Charge.	Muzzle Velocity.	Muzzle Energy.	Penetration at Muzzle, Krupp Armour, using Capped Projectile.	At 3000 Yards. Remaining Velocity.	At 3000 Yards. Penetration.	At 6000 Yards. Remaining Velocity.	At 6000 Yards. Penetration.	At 9000 Yards. Remaining Velocity.	At 9000 Yards. Penetration.
			inch.			tons.	lb.	lb.	ft.-seconds.	ft.-tons.	inch.	ft.-seconds.	inch.	ft.-seconds.	inch.	ft.-seconds.	inch.
3-in. R.F.G.	II., III.	50	154	219	128·3	0·9	13	3·85	2700	658	3·3	1230	1·2	848	0·8	..	..
3-in. S.A.	V, VI.	50	159	219	128·3	1·0	13	3·85	2700	658	3·3	1230	1·2	848	0·8	..	..
4-in. R.F.G.	III., IV., V., VI.	40	164	331	134·5	1·5	33	4·85	2000	915	3·4	1156	1·7	897	1·2	..	..
4-in. R.F.G.	VII.	50	205	652	168·3	2·6	33	9·0	2500	1,430	4·6	1432	2·2	979	1·4	853	1·2
4-in. R.F.G.	VIII.	50	205	652	168·3	2·9	33	12·3	2800	1,794	5·3	1627	2·6	1033	1·5	878	1·2
5-in. R.F.G.	II., III., IV.	40	206	656	165·8	3·1	50	10·0	2300	1,852	5·3	1286	2·6	934	1·7	829	1·4
5-in. B.L.R.	V., VI.	50	256	1,200	215·6	4·6	60	19·2	2700	3,032	6·2	1692	3·5	1102	2·0	928	1·6
5-in. B.L.R.	VI.	50	256	1,200	215·6	4·6	50[1]	20·5	3000[1]	3,122	6·4	1732	3·2	1057	1·7	877	1·4
5-in. R.F.G.	VII.	51	261	1,135	215·6	5·0	50	23·8	3150	3,439	6·8	1835	3·4	1091	1·8	895	1·4
6-in. R.F.G.	II., III.	30	196	1,287	150·0	4·8	105	18·8	1950	2,768	5·3	1305	3·2	1009	2·3	909	2·0
6-in. R.F.G.	IV., VII.	40	256	1,320	205·8	6·0	105	18·8	2150	3,365	6·0	1440	3·6	1058	2·4	934	2·1
6-in. R.F.G.	IX.	45	270	1,320	221·7	7·0	105	18·8	2250	3,685	6·3	1511	3·8	1086	2·5	948	2·1
6-in. B.L.R.	VI.	50	300	2,101	247·5	8·3	105	30·0	2600	4,920	8·6	1770	4·7	1207	2·9	996	2·2
6-in. B.L.R.	VIII.	50	300	2,101	247·5	8·6	105	37·0	2800	5,707	11·3	1923	5·2	1297	3·2	1026	2·3
7-in. B.L.R.	II.	45	323	3,643	259·8	12·7	165	58·0	2700	8,338	9·6	1948	6·4	1382	4·2	1083	3·0
8-in. B.L.R.	III., IV.	35	305	3,170	245·8	13·1	260	43·8	2100	7,948	8·6	1576	6·0	1206	4·2	1040	3·6
8-in. B.L.R.	V. and VI.	45	369	5,243	299·1	18·7	260	98·5	2750	13,360	12·0	2106	8·6	1589	6·1	1227	4·4
10-in. B.L.R.	I., II.	30	329	6,779	251·1	25·1	510	90·0	2000	14,141	10·7	1590	8·0	1274	6·1	1103	5·0
10-in. B.L.R.	III.	40	413	10,222	327·0	34·6	510	207·5	2700	25,772	19·4	2184	11·9	1747	9·0	1406	6·9
12-in. B.L.R.	I., II.	35	441	11,991	345·2	45·3	870	160·0	2100	26,596	14·2	1733	11·2	1433	8·8	1219	7·2
12-in. B.L.R.	III., IV.	40	493	17,096	392·2	52·1	870	237·5	2400	31,738	19·8	1994	13·3	1649	10·5	1376	8·3
12-in. B.L.R.	III., IV.	40	493	17,096	392·2	52·1	870	305·0[2]	2600[2]	40,768	18·5	2171	14·8	1801	11·7	1500	9·3
12-in. B.L.R.	V.	45	553	16,974	452·0	52·9	870	305·0	2700	43,964	19·4	2259	15·5	1877	12·3	1561	9·8
12-in. B.L.R.	VI.	45	553	14,970	452·0	53·6	870	340·0[3]	2850[3]	48,984	20·8	2393	16·6	1991	13·3	1653	10·6
12-in. B.L.R.	VII.	50	607	14,296	506·3	56·1	870	340·0[3]	2950[3]	52,483	25·7	2483	17·5	2071	13·9	1719	11·0
13-in. B.L.R.	I., II.	35	479	15,068	374·9	61·4	1130	180·0	2000	31,333	15·0	1679	12·0	1414	9·7	1221	8·1
14-in. B.L.R.	I.	45	642	..	..	63·6	1400	365·0	2600	65,606	28·3*	..	23·4*	..	..	..	..

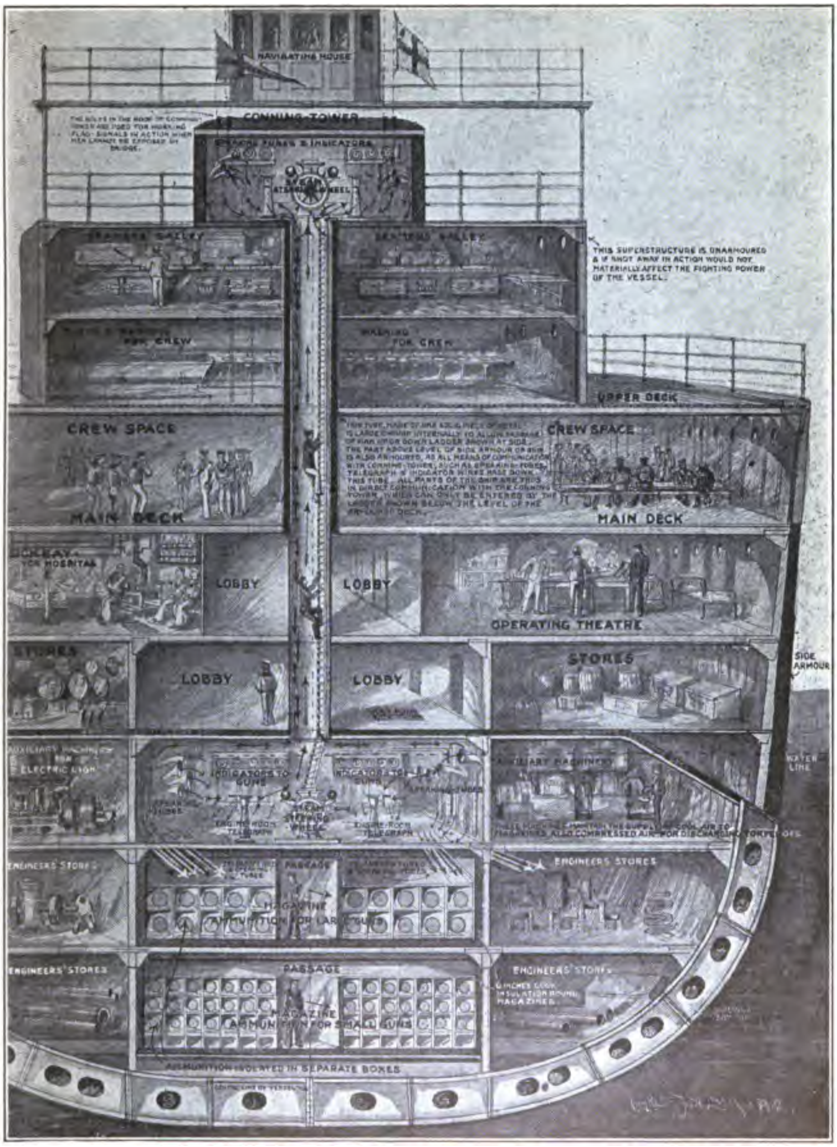
* Harveyized armour.

Corrected to March, 1913.

ABBREVIATIONS.

The following abbreviations are used in the tables of Armoured Ships, pages 420–424:

(ac) Armoured cruiser.
(b) Battleship.
(cds) Coast-defense ship.
(t) Turret-ship (In class column).
(t) Speed and I. H. P. at trials (In speed and I. H. P. column).
(H.S.) Harveyized or similar hard-faced steel.
(K S) Krupp steel.
(Sub.) Submerged torpedo tube.
(B. & W.) Babcock & Wilcox boilers.
(Nic.) Niclausse Boilers.
(W. T.) Water-tube Boilers.
(T.) Thornycoft boilers.



Courtesy of "The Illustrated London News."

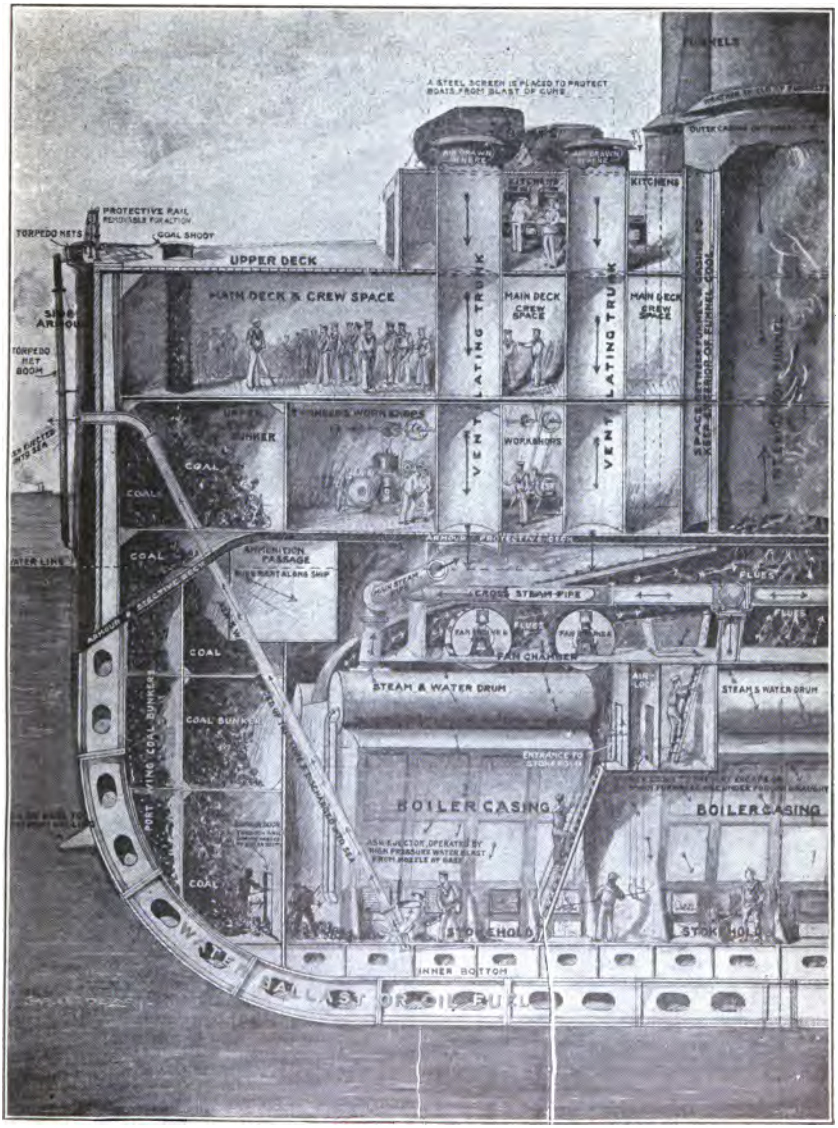
THE CONNING TOWER SECTION OF A "SUPER-DREADNOUGHT."

UNITED STATES—ARMOURED SHIPS.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where built.	Date of Launch.	Date of Completion.	Armour.						Armament.		Speed.	Coal.	Complement.
										Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	Alabama...	11,552	368	72¼	23½	11.207 *t*	Philadelphia.	1898	1900	16½–4 H.S.	2¾–4	5¼ H.S.	12 H.S.	15 H.S.	6 H.S.	4 *13-in.*, 14 *6-in.*, 4 *3-in.*, 4 *6-pr.*, 2 *1-pr.*, 4 M., 2 l		17.0 *t*	800 / 1447	592
b.	Arkansas...	26,000	554	93¼	28½	28,000 tur.	Camden, N. J	1911	....	11–9 K.S.	.....	.....	8–6 K.S.	11 K.S.	8	12 *12-in.*, 21 *5-in.*, 4 *3-pr.*, 2 M., 2 l.	2 (sub.)	21.0	1650 / 2699	1115
e.	Brooklyn..	9215	400½	64¾	24	18,425 *t*	Philadelphia.	1895	1896	3 H.S.	6–3	4 H.S.	.....	8 H.S.	5½ H.S.	8 *8-in.*, 12 *5-in.*, 4 *6-pr.*, 4 *1-pr.*, 4 M., 2 l.	..	21.9 *t*	900 / 1350	718
a.c.	California..	13,680	502	69½	24	29,381*t* B.&W.	S.Francisco	1904	1907	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 4 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 (sub.)	22.2 *t*	900 / 2185	829
e.	Charleston..	9700	424	66	22½	27,200 B.&W.	Newport News	1904	1906	4 H.S.	3	4 H.S.	.....	4 H.S.	.....	14 *6-in.*, 18 *3-in.*, 4 *3-pr.*, 12 *1-pr.*, 10 M., 2 l.	..	22.0	650 / 1776	664
a.c.	Colorado...	13,680	502	69½	24	26,837 Nic.	Philadelphia.	1903	1905	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 4 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 (sub.)	22.2 *t*	900 / 1929	829
b.	Connecticut	16,000	450	76¾	24½	20,525 B.&W.	Camden, N.J.	1904	1906	11½ K.S.	3	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 4 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	4 (sub.)	18.8 *t*	900 / 2452	803
b.	Delaware...	20,000	510	85¼	27	29,025	Newport News	1909	1910	11 K.S.	......	10–8 K.S.	.....	11 K.S.	5 K.S.	10 *12-in.*, 14 *5-in.*, 4 *3-pr.*, 2 l., 12 M.	2 (sub.)	21.5 *t*	1000 / 2668	927
b.	Florida.....	21,825	510	88¼	28½	28,000 tur.	New York...	1910	1911	11	......	10	.....	11	5	10 *12-in.*, 16 *5-in.*, 4 *3-pr.*, 4 M., 2 l.	2 (sub.)	22.1 *t*	1000 / 2500	1014
b.	*Georgia.....	14,948	435	76¼	23¾ †	25,088*t* Nic.	Bath, Me....	1904	1906	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 4 *6-pr.*, 8 *1-pr.*, 8 M., 2 l.	4 (sub.)	19.2 *t*	900 / 1967	812
b.	Idaho......	13,000	375	77	24¾	14,235 B.&W.	Philadelphia.	1905	1908	9–4 K.S.	3–1½	7 K.S.	7 K.S.	10–7½ K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *7-in.*, 12 *3-in.*, 4 *6-pr.*, 4 *1-pr.*, 8 M., 2 l.	2 (sub.)	17.2 *t*	600 / 1824	725
b.	Illinois.....	11,552	368	72¼	23½	12,757	Newport News	1898	1901	16½–4 H.S.	2¾–4	5¼ H.S.	12 H.S.	15 H.S.	6 H.S.	4 *13-in.*, 14 *6-in.*, 4 *3-in.*, 4 *6-pr.*, 6 *1-pr.*, 4 M., 2 l.	....	17.45 *t*	800 / 1275	686
b.	Indiana....	10,288	348	69¼	24	9,607 B.&W.	Philadelphia.	1893	1895	18 H.S.	2¾	5 H.S.	17 H.S.	17 H.S.	10 H.S.	4 *13-in.*, 8 *8-in.*, 12 *3-in.*, 4 *6-pr.*, 2 M., 1 l.	....	15.5 *t*	400 / 1500	497

* Superposed turrets.

† Mean draught.



Courtesy of "The Illustrated London News."

THE BOILER-ROOM SECTION OF A "SUPER-DREADNOUGHT."

Note the Water-Tube Boilers.

UNITED STATES—ARMOURED SHIPS.—Continued.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where built.	Date of Launch.	Date of Completion.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulk-head.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	Iowa.......	11,364	360	72¼	24	11,933	Philadelphia.	1896	1897	14 H.S.	2¾	5 H.S.	12 H.S.	15 H.S.	8–6 H.S.	4 *12-in.*, 8 *8-in.*, 10 *4-in.*, 4 *6-pr.*, 6 M., 2 l.	....	17.1 t	625 / 1643	520
b.	Kansas.....	16,000	450	77	24½	19,545 B.&W	Camden, N.J.	1905	1907	8–11 K.S.	3–4½	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 4 *6-pr.*, 8 *1-pr.*, 8 M., 2 l.	4 (sub.)	18.1 t	900 / 2388	854
b. / b.	*Kearsarge.. / *Kentucky ..	11,520	368	72¼	23½	{11,788 / 12,179}	Newport News	1898	1899	16½–4 H.S.	2¾–5	5½ H.S.	.....	15 H.S.	9 H.S.	4 *13-in.*, 4 *8-in.*, 18 *5-in.*, 4 *6-pr.*, 8 *1 pr.*, 4 M., 2 l.	{1 / ....}	t 16.8 / 16.9 t	410 / 1640 / 1620	{690 / 686}
b.	Louisiana...	16,000	450	76¾	24½	20,748 B.&W.	Newport News.	1904	1906	11–8 K.S.	3	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 4 *6-pr.*, 8 *1-pr.*, 8 M., 2 l.	4	18.8 t	900 / 2389	803
b.	Maine......	12,500	388	72¼	23¾	15,693 Nic.	Philadelphia.	1901	1902	11–4 K.S.	2¾–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 16 *6-in.*, 6 *3-in.*, 4 *3-pr.*, 6 *1-pr.*, 2 M., 2 l.	2 (sub.)	18 0 t	1000 / 1860	551
a.c.	Maryland...	13,680	502	69½	24	28,059 B.&W.	Newport News.	1903	1905	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 4 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 (sub.)	22.4 t	900 / 2054	829
b.	Massa-chusetts	10,288	348	69¼	24	10,240	Philadelphia.	1893	1896	18 H.S.	2¾	5 H.S.	17 H.S.	17 H.S.	10–5 H.S.	4 *13-in.*, 8 *8-in.*, 12 *3-in.*, 4 *6-pr.*, 2 M., 2 l.	....	16.2 t	400 / 1487	509
b.	Michigan...	16,000	450	80¼	24½	16,310 B.&W.	Camden, N. J	1908	1909	11–9	3	8	10	10–8	8	8 *12-in.*, 22 *3-in.*, 4 *3-pr.*, 12 M., 2 l.	2 (sub.)	18.8 t	900 / 2380	669
c.	Milwaukee..	9700	424	66	22½	24,166 W.T.	S. Francisco.	1904	1906	4 H.N.S.	3	4 H.N.S.	.....	4 H.N.S.	......	14 *6-in.*, 18 *3-in.*, 4 *3-pr.*, 12 *1-pr.*, 10 M., 2 l.	....	22 2 t	650 / 1704	664
b.	Minnesota..	16,000	450	77	24½	20,235 B.&W.	Newport News.	1905	1907	8–11 K.S.	3–4½	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 4 *6-pr.*, 8 *1-pr.*, 8 M., 2 l.	4 (sub.)	18.8 t	900 / 2364	881
b.	Mississippi..	13,000	375	77	24¾	13,607 B.&W.	Philadelphia.	1905	1908	9–4 K.S.	3–1½	7 K.S.	7 K.S.	10–7½ K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *7-in.*, 12 *3-in.*, 4 *6-pr.*, 4 *1-pr.*, 8 M., 2 l.	2 (sub.)	17.11 t	600 / 1824	725
t.	Missouri....	12,500	388	72¼	24	15,845 T.	Newport News.	1901	1903	12–4 K.S.	2¾–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 16 *6-in.*, 6 *3-in.*, 4 *3-pr.*, 4 *1-pr.*, 2 M., 2 l.	2 (sub.)	18.1 t	1000 / 1887	551
a.c.	Montana...	14,500	502	73	25	27,938 B.&W.	Newport News.	1906	1908	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 16 *6-in.*, 22 *3-in.*, 4 *6-pr.*, 4 *1-pr.*, 4 M., 2 l.	4 (sub.)	22.3 t	900 / 2113	845

d.	Monterey...	4084	256	59	14¾	5244 B.&W.	S. Francisco..	1891	1893	13–6 H.S.	3	....	....	13 H.S.	......	2 12-in., 2 10-in., 6 6-pr., 4 1-pr., 2 M.	....	13.6 t	200 / 206	218
b.	*Nebraska...	14,948	435	76¼	23¾ †	21,283 B.&W.	Seattle......	1904	1907	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 12-in., 8 8-in., 12 6-in., 12 3-in., 4 6-pr., 8 1-pr., 8 M., 2 l.	4 (sub.)	19.1 t	900 / 1923	812
b.	Nevada......	27,500	575	95¼	28½	......	Quincy, Mass	......	......	......	......	......	......	......	......	10 14-in., 21 5-in., 4 3-pr.	4 (sub.)	20.5	§2000	
b.	New Hampshire	16,000	450	77	24½	19,100 B.&W.	Camden, N.J.	1906	1908	9–4 K.S.	3	7 K.S.	7 K.S.	12 K.S.	7 K.S.	4 12-in., 8 8-in., 12 7-in., 20 3-in., 4 6-pr., 4 1-pr., 4 M., 2 l.	4 (sub.)	18.2 t	900 / 2592	916
b.	*New Jersey.	14,948	435	76¼	23¾ †	23,089 B.&W.	Quincy, Mass	1904	1906	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 12-in., 8 8-in., 12 6-in., 12 3-in., 12 3-pr., 8 1-pr., 8 M., 2 l.	4 (sub.)	19.4 t	900 / 1900	812
b.	New York...	27,000	565	95¼	28½	35,000	New York...	1912	....	11–5 K.S.	3	9	....	11 K.S.	5 K.S.	10 14-in., 21 5-in., 4 3-pr..........	4 (sub.)	21.0	2850	
a.c.	North Carolina	14,500	502	73	25	29,785 B.&W.	Newport News.	1906	1908	5–3 K.S.	3	5 K.S.	9 K.S.	9 K.S.	5 K.S.	4 10-in., 16 6-in., 22 3-in., 4 6-pr., 4 1-pr., 4 M., 2 l.	4 (sub.)	22.48 t	900 / 2113	845
b.	North Dakota	20,000	510	85¼	27	31,400 Cur.tur.	Quincy, Mass	1908	1910	11 K.S.	......	10–8 K.S.	....	11 K.S.	5 K.S.	10 12-in., 14 5-in., 4 3-pr., 2 l., 12 M.	2 (sub.)	21.0 t	1000 / 2676	960
b.	Ohio.......	12,500	388	72¼	23½	16,220 T.	S. Francisco..	1901	1904	11–4 K.S.	3–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 12-in., 16 6-in., 6 3-in., 4 6-pr., 6 1-pr., 2 M., 2 l.	2 (sub.)	17.8 t	1000 / 2277	521
b.	Oklahoma..	27,500	575	95¼	28½	......	Camden, N.J.	......	......	......	......	......	......	......	......	10 14-in., 21 5-in., 4 3-pr..........	4 (sub.)	20.5	§2000	
b.	Oregon....	10,288	348	69¼	24	11,037	S. Francisco..	1893	1896	18 H.S.	2¾	5 H.S.	17 H.S.	17 H.S.	10–5 H.S.	4 13-in., 8 8-in., 12 3-in., 4 6-pr., 2 1-pr., 4 M.	....	16.8 t	400 / 1425	500
b.	Pennsyl-vania	31,400	600	97	28¾	......	Newport News.	......	......	......	......	......	......	......	......	12 14-in., 22 5-in., 4 3-pr.	4 (sub.)	21.0	§2322	
a.c.	Pittsburgh..	13,680	502	69½	24	28,600 Nic.	Philadelphia.	1903	1905	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 8-in., 14 6-in., 18 3-in., 4 3-pr., 8 1-pr., 8 M., 2 l.	2 (sub.)	22.4 t	900 / 1946	829
b.	*Rhode Island	14,948	435	76¼	23¾ †	20,310 B.&W.	Quincy, Mass	1904	1906	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 12-in., 8 8-in., 12 6-in., 12 3-in., 4 6-pr., 8 1-pr., 8 M., 2 l.	4 (sub.)	19.0 t	900 / 1900	812
c.	Saratoga....	8150	380½	64¾	23¼	17,075	Philadelphia.	1891	1893 1909	4 H.S.	2½	...... K.S.	....	6½ H.S.	5–4 H.S.	4 8-in., 10 5-in., 8 3-in., 4 3-pr., 4 M.	....	21.0 t	750 / 1075	498
c.	St. Louis...	9700	424	66	22½	27,264 B.&W.	Philadelphia. (Cramp)	1905	1906	4 K.S.	3	4–3	....	4 K.S.	......	14 6-in., 18 3-in., 4 3-pr., 12 1-pr., 10 M., 2 l.	....	22.1 t	650 / 1751	664
b.	South Carolina	16,000	450	80¼	24½	18,357 B.&W.	Philadelphia. (Cramp)	1908	1909	11–9	3	8	10	10–8	8	8 12-in., 22 3-in., 2 3-pr., 12 M., 2 l.	2 (sub.)	18.9 t	900 / 2200	669
a.c.	South Dakota	13,680	502	69½	24	28,598 B.&W.	S. Francisco..	1904	1907	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 8-in., 14 6-in., 18 3-in., 4 3-pr., 8 1-pr., 8 M., 2 l.	2 (sub.)	22.2 t	900 / 2185	829

* Superposed turrets. † Mean draught. § Tons of oil fuel.

UNITED STATES—ARMOURED SHIPS.—Continued.

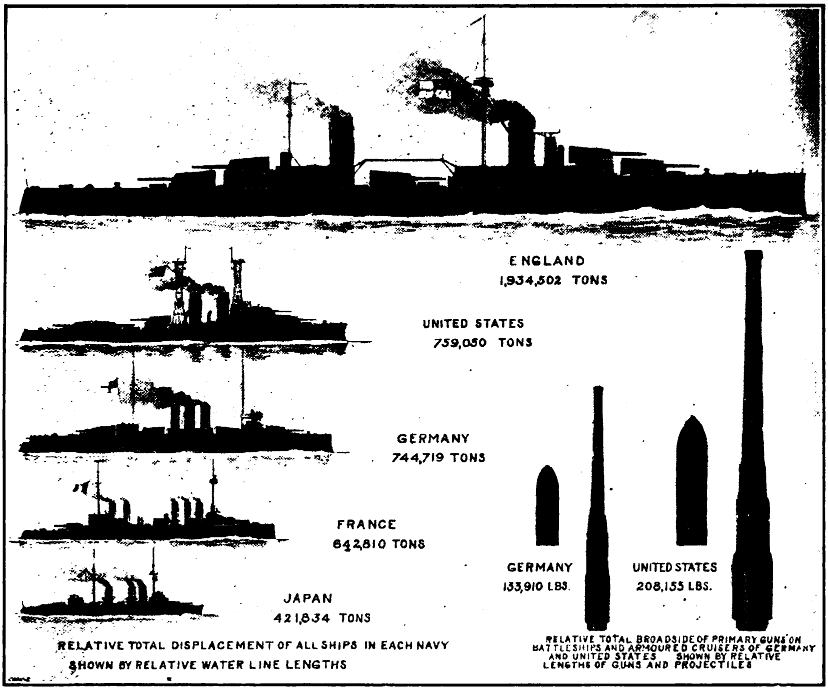
Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where built.	Date of Launch.	Date of Completion.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulk-head.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	Tennessee..	14,500	502	72¾	25	26,963 B.&W.	Philadelphia.	1904	1906	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 16 *6-in.*, 22 *3-in.*, 4 *3-pr.*, 4 *1-pr.*, 8 M., 2 l.	4 (sub.)	22.2 t	900 / 1974	858
b.	Texas.......	27,000	565	95¼	28½	35,000	Newport News.	1912	....	11–5 K.S.	3	9 K.S.	.....	11 K.S.	5 K.S.	10 *14-in.*, 21 *5-in.*, 4 *3-pr.*	4 (sub.)	21.0	2892	
b.	Utah.......	21,825	510	88¼	28½	28,000 tur.	Camden, N.J.	1909	1911	11	....	10	....	11	5	10 *12-in.*, 16 *5-in.*, 4 *6-pr.*, 4 M., 2 l.	2 (sub.)	21.0	1000 / 2520	1014
b.	Vermont..	16,000	450	77	24½	17,982 B.&W.	Quincy, Mass	1905	1907	8–11 K.S.	3–4½	8 K.S.	7 K.S.	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 4 *6-pr.*, 8 *1-pr.*, 8 M., 2 l.	4 (sub.)	18.33 t	900 / 2428	854
b.	*Virginia....	14,948	435	76¼	23¾ †	22,841 Nic.	Newport News.	1904	1906	11–8 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 4 *6-pr.*, 8 *1-pr.*, 8 M., 2 l.	4 (sub.)	19.0 t	900 / 1924	812
a.c.	Washington	14,500	502	72¾	25	27,152 B.&W.	Camden, N.J.	1905	1906	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 16 *6-in.*, 22 *3-in.*, 4 *3-pr.*, 4 *1-pr.*, 8 M., 2 l.	4 (sub.)	22.3 t	900 / 2015	858
a.c.	West Virginia	13,680	502	69½	24	26,135 B.&W.	Newport News.	1903	1905	6–3½ K.S.	4	5 K.S.	12 H.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 4 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 (sub.)	22.1 t	900 / 2054	829
b.	Wisconsin.	11,552	368	72¼	23½	12,452	S. Francisco..	1898	1901	16½–4 H.S.	3–4	5½ H.S.	.....	15 H.S.	6 H.S.	4 *13-in.*, 14 *6-in.*, 4 *3-in.*, 4 *6-pr.*, 6 *1-pr.*, 4 M., 2 l.	....	17.2 t	800 / 1413	583
b.	Wyoming...	26,000	554	93¼	28½	28,000 tur.	Philadelphia.	1911	1912	11–9 K.S.	......	.....	8–6 K.S.	11 K.S.	8	12 *12-in.*, 21 *5-in.*, 4 *3-pr.*, 2 M., 2 l.	2 (sub.)	21.2	1650 / 2500	1115
b.	Battleship No. 39	31,400	600	97	28¾	....	New York	Bldg.	...	......	.....	.....	.....	.....	......	12 *14-in.*, 22 *5-in.*, 4 *3-pr*	4 (sub.)	21.0	¶2322	

Also the monitors Amphitrite, Miantonomoh, Monadnock, and Terror, 3990 tons, Tonopah (*ex* Nevada), 3225 tons, Tallahassee (*ex* Florida) and Ozark (*ex* Arkansas), 3225 tons, Cheyenne (*ex* Wyoming), 3225 tons.

† Mean draught. ‡ Including armour, but not armament. ¶ Tons of oil fuel.

MODIFIED WHITEHEAD TORPEDO. (Page 411.)

P. Plunger or striking rod. g. Safety-pin. C. Guncotton charge. D. Detonating charge. B. Air-flask. J. Charging valve. K. Hydrostatic valve. H. Pendulum. M. Turbine. N. Submergence control mechanism. S. Submergence valve. S. H. Superheater. K. Valve case. Y. Air lever. O. Immersion servo-motor. L. Pressure regulator. V. Gyroscope. T. Gyroscope impulse. U. Servo-motor. G. V. Rudders for horizontal control. G. H. Rudders for vertical control. F. and G. Rudder controls. E. E. Propeller shaft. I. I. Propellers. R. Shaft gearing. A. After-body. L. B. Ballast.



GRAPHIC COMPARISON OF THE RELATIVE STRENGTH OF THE WORLD'S NAVIES.

The greater gun power of the U. S. Navy as compared with that of Germany is due to our pre-Dreadnought ships carrying heavier guns in the main batteries. Future sea-fights will be fought with Dreadnoughts. At the present rate of construction, Germany, in 1917, will possess twice as many Dreadnoughts as the United States.

NAVY DEPARTMENT.

The Secretary of the Navy performs such duties as the President of the United States, who is Commander in Chief, may assign him, and has the general superintendence of construction, manning, armament, equipment, and employment of vessels of war. He is assisted by the Assistant Secretary and the Chief Clerk. There are also various bureaus under his supervision, the principal duties of which are as follows:

Bureau of Navigation.—Has supervision and control of the Naval Academy and the education and training of line officers and enlisted men. It establishes the complements of all ships in commission.

Bureau of Yards and Docks.—Its duties comprise all that relates to the design and construction of docks (including dry-docks), ships, wharves, piers, quay walls and the maintenance of same. It has charge of the construction, repair, maintenance and operation of power plants at navy yards.

Bureau of Ordnance.—Its duties comprise all that relates to the torpedo station, naval proving ground, and magazines on shore, to the manufacture of offensive and defensive arms and apparatus, all ammunition and war explosives.

Bureau of Construction and Repair.—Its duties comprise the responsibility for the structural strength and stability of all ships built for the Navy.

Bureau of Steam Engineering.—Its duties comprise all that relates to designing, building, fitting out, and repairing machinery used for the propulsion of naval ships.

The duties of the Bureau of Medicine and Surgery, and Bureau of Supplies and Accounts are apparent by their names.

LIST OF SHIPS OF THE UNITED STATES NAVY.

CRUISERS, FIRST CLASS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L. W. L.	Dimensions. Beam on L. W. L.	Dimensions. Draft aft at designed full load.	Speed (trial).	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Date authorized.
	Tons.	Tons.	Ft. in.	Ft. in.	Ft. in.	Knots.			Tons.	
Brooklyn [a]........	9,215	3,368	400 6	64 8	26 6	21.91	20	12	[b] 1,350	July 92
Charleston [a].......	9,700	....	424 0	66 0	24 10	22.04	14	22	[b] 1,776	June 00
Milwaukee........	9,700	[c] 3,401	424 0	66 0	24 10	22.22	14	22	[b] 1,704	...do....
Saratoga [a]........	8,150	2,838	380 6	64 10	26 4	21.00	14	12	[b] 1,075	Sept. 88
St. Louis.........	9,700	....	424 0	66 0	24 10	22.13	14	22	[b] 1,757	June 00

CRUISERS, SECOND CLASS.

Name.	Displacement.	Net tonnage for Suez Canal.	Length on L. W. L.	Beam on L. W. L.	Draft	Speed (trial).	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Date authorized.
Baltimore........	4,413	1,706	327 6	48 7½	24 5	20.10	12	4	1,079	Aug. 86
Chicago [a]........	4,500	[c] 1,560	325 0	48 4½	22 0	[d] 18.00	18	9	[b] 850	Mar. 83
Columbia.........	7,350	2,536	411 7	58 2	24 6	22.80	11	12	[e] 1,525	June 90
Minneapolis [a].....	7,350	2,537	411 7	58 2	24 6	23.07	11	12	[e] 1,400	Mar. 91
Newark [a].........	4,083	[c] 1,438	311 5	49 2	22 4	[d] 19.00	12	6	[e] 800	Mar. 85
Olympia [a]........	5,865	[c] 1,896	340 0	53 0½	25 0	21.69	14	4	[e] 1,000	Sept. 88

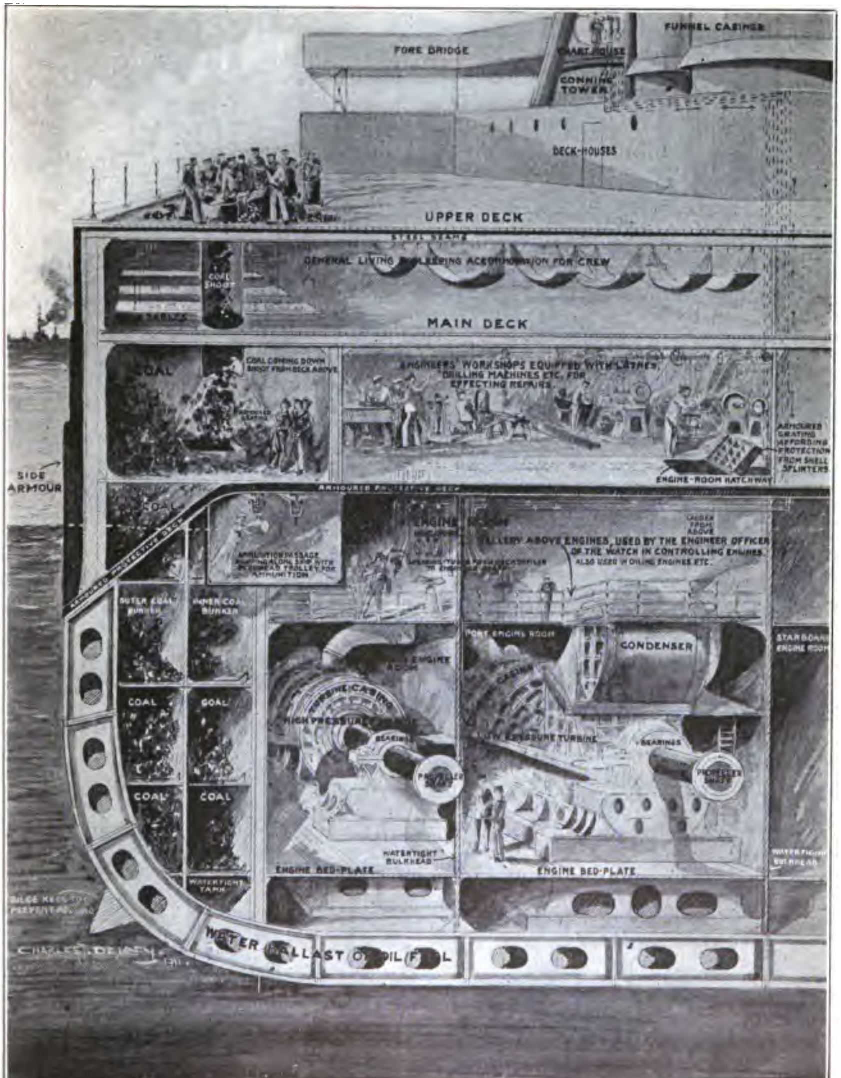
CRUISERS, THIRD CLASS.

Name.	Displacement.	Net tonnage for Suez Canal.	Length on L. W. L.	Beam on L. W. L.	Draft	Speed (trial).	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Date authorized.
Albany..........	3,430	[c] 1,121	346 0	43 9	19 1	20.52	10	8	[e] 821	....
Birmingham.....	3,750	....	420 0	47 1	18 9	24.33	2	[f] 8	1,400	Apr. 04
Boston...........	3,000	[c] 1,280	277 5	42 2	20 10	15.60	6	6	[b] 428	Mar. 83
Chattanooga.....	3,200	....	292 0	44 0	17 0	16.65	10	8	[e] 733	Mar. 99
Chester..........	3,750	....	420 0	47 1	18 9	26.52	2	[f] 8	1,375	Apr. 04
Cincinnati.......	3,183	[c] 934	300 0	42 0	19 6	19.91	11	6	[e] 712	Sept. 88
Cleveland........	3,200	....	292 0	44 0	17 0	16.45	10	8	[e] 120	Mar. 99
Denver...........	3,200	1,566	292 0	44 0	17 0	16.75	10	8	[e] 710	Mar. 99
Des Moines.......	3,200	....	292 0	44 0	17 0	16.65	10	8	[e] 700	Mar. 99
Galveston........	3,200	....	292 0	44 0	17 0	16.41	10	8	[e] 724	Mar. 99
Marblehead......	2,072	[c] 626	257 0	37 0	16 3	18.44	8	4	[b] 346	Sept. 88
New Orleans.....	3,430	[c] 1,130	346 0	43 9	19 1	[d] 20.00	10	8	[c] 750	....
Raleigh..........	3,183	[c] 934	300 0	42 0	19 6	21.12	11	6	[e] 698	Sept. 88
Salem............	3,750	....	420 0	47 1	18 9	25.92	2	[f] 8	1,400	Apr. 04
Tacoma..........	3,200	1,554	292 0	44 0	17 0	16.58	10	8	[e] 710	Mar. 99

MONITORS.

Name.	Displacement.	Net tonnage for Suez Canal.	Length on L. W. L.	Beam on L. W. L.	Draft	Speed (trial).	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Date authorized.
Amphitrite.......	3,990	....	259 3	55 4	14 8	10.50	6	2	[b] 271	Aug. 86
Cheyenne........	3,225	....	252 0	50 0	13 3	11.80	6	3	[bg] 129	May 98
Miantonomoh....	3,990	....	260 3	55 4	15 0	10.50	4	2	[b] 250	Aug. 86
Monadnock......	3,990	[c] 988	258 6	55 5	14 8	11.63	6	5	[b] 386	Aug. 86
Monterey........	4,084	[c] 840	256 0	59 0½	15 4	13.60	4	6	[b] 206	Mar. 87
Ozark............	3,225	....	252 0	50 0	13 3	12.03	6	3	344	May 98
Puritan..........	6,060	....	290 3	60 1½	18 3	12.40	10	6	[b] 306	Aug. 86
Tallahassee.......	3,225	....	252 0	50 0	13 3	12.40	6	3	[b] 355	May 98
Terror............	3,990	....	258 8	55 6	14 8	10.50	8	2	276	Aug. 86
Tonopah [h].......	3,225	....	252 0	50 0	13 3	13.04	6	3	[b] 338	May 98

[a] Fitted as a flagship.
[b] To 6 inches below beam.
[c] Subject to possible change.
[d] Estimated.
[e] Capacity to bottom of beams.
[f] Two torpedo tubes.
[g] Also 60,816 gallons fuel oil.
[h] Acting as submarine tender.



Courtesy of "The Illustrated London News."

THE ENGINE SECTION OF A TURBINE DRIVEN "SUPER-DREADNOUGHT."

DESTROYERS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L. W. L.	Dimensions. Beam on L. W. L.	Dimensions. Draft aft at designed full load.	Speed (trial).	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Date authorized.
	Tons.	Tons.	Ft. in.	Ft. in.	Ft. in.	Knots.			Tons.	
Ammen	742	....	289 0	26 1½	9 5	30.48	b 3	5	e67,855	Mar. 09
Bainbridge	420	229	245 0	23 1	9 4	28.45	c 2	7	d 169	May 98
Barry	420	229	245 0	23 1	9 4	28.13	c 2	7	d 169	May 98
Beale	742	....	289 0	26 1½	9 5	29.65	b 3	5	e65,974	June 10
Burrows	742	....	289 0	26 1½	9 5	30.67	b 3	5	e70,176	May 08
Chauncey	420	229	245 0	23 1	9 4	28.64	c 2	7	d 169	May 98
Dale	420	229	245 0	23 1	9 2	28.00	c 2	7	d 174	May 98
Decatur	420	229	245 0	23 1	9 2	28.10	c 2	7	d 174	May 98
Drayton	742	....	289 0	26 1½	9 6	30.83	b 3	5	e70,500	May 08
Fanning	742	....	289 0	26 1½	9 5	29.99	b 3	5	e65,974	June 10
Flusser	700	....	289 0	26 0	10 0	30.41	c 3	5	303	May 07
Henley	742	....	289 0	26 1½	9 5	....	b 3	5	e68,487	June 10
Hopkins	408	....	238 9	23 1½	10 5	29.02	c 2	8	143	May 98
Hull	408	....	238 9	23 1½	10 3	28.04	c 2	8	143	May 98
Jarvis	742	....	289 0	26 1½	9 5	....	b 3	5	e65,974	June 10
Jenkins	742	....	289 0	26 1½	9 5	31.27	b 3	5	e65,974	June 10
Jouett	742	....	289 0	26 1½	9 5	32.27	b 3	5	e65,974	June 10
Lamson	700	....	289 0	26 0	10 7	28.61	c 3	5	284	June 06
Lawrence	400	....	240 7	22 2½	9 5	28.41	c 2	7	d 108	May 98
Macdonough	400	....	240 7	22 2½	9 5	28.03	c 2	7	d 108	May 98
Mayrant	742	....	289 0	26 1½	9 5	30.22	b 3	5	e73,583	May 08
McCall	742	....	289 0	26 1½	9 5	30.66	b 3	5	e70,575	May 08
Monaghan	742	....	289 0	26 1½	9 5	30.45	b 3	5	e70,074	May 09
Patterson	742	....	289 0	26 1½	9 5	29.69	b 3	5	e71,457	Mar. 09
Paulding	742	....	289 0	26 1½	9 6	32.80	b 3	5	e70,580	May 08
Paul Jones	420	a 229	245 0	23 1	8 11	28.91	c 2	7	168	May 98
Perkins	742	....	289 0	26 1½	10 1	29.76	b 3	5	e73,815	May 08
Perry	420	a 229	245 0	23 1	8 11	28.32	c 2	7	d 168	May 98
Preble	420	a 229	245 0	23 1	8 11	28.03	c 2	7	d 168	May 98
Preston	700	....	289 0	26 0	10 11	29.18	c 3	5	d 271	June 06
Reid	700	....	289 0	26 0	10 0	31.82	c 3	5	d 303	Mar. 07
Roe	742	....	289 0	26 1½	10 11	29.60	b 3	5	e70,074	May 08
Smith	700	....	289 0	26 0	10 7	28.35	c 3	5	d 286	June 06
Sterett	742	....	289 0	26 1½	10 1	30.37	b 3	5	e73,815	May 08
Stewart	420	....	245 0	23 1	9 2	29.69	c 2	7	d 172	May 98
Terry	742	....	289 0	26 1½	10 11	30.24	b 3	5	e70,074	May 08
Trippe	742	....	289 0	26 1½	9 5	30.89	b 3	5	e70,580	Mar. 09
Truxtun	433	....	248 0	22 3½	9 10	29.58	c 2	8	d 173	May 98
Walke	742	....	289 0	26 1½	9 5	29.78	b 3	5	e67,817	Mar. 09
Warrington	742	....	289 0	26 1½	9 5	30.12	b 3	5	e73,583	May 08
Whipple	433	....	248 0	22 3½	9 10	28.24	c 2	8	d 173	May 98
Worden	433	....	248 0	22 3½	9 10	29.86	c 2	8	d 173	May 98

a Subject to possible change.
b Twin 18-inch Whitehead torpedo tubes (long).
c Eighteen-inch Whitehead torpedo tubes (long).
d Capacity to 6 inches below beams.
e Oil fuel, gallons.

TENDERS TO TORPEDO VESSELS.

	Tons.	Tons.	Ft. in.	Ft. in.	Ft. in.	Knots.			Tons.
Alert	1,110	b 713	177 4	32 0	13 0	10.00	6	4	197
Castine	1,177	b 398	204 0	32 1½	12 0	16.03	....	....	210
Dixie	6,114	b 3,074	391 6	48 3	19 11	a 14.50	....	12	1,075
Iris	a 6,100	b 1,923	310 6	39 0	24 0	10.00	....	....	300
Mohican	1,000	....	216 0	37 0	16 6	....	....	4	168
Pompey	3,085	....	245 0	33 6	15 10	10.50	....	....	200
Severn	1,175	b 865	175 0	37 0	16 6	(c) •	....	....	....

TORPEDO BOATS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L. W. L.		Beam extreme.		Mean draft.		Speed (trial).	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Date authorized.
	Tons.	Tons.	Ft.	in.	Ft.	in.	Ft.	in.	Knots.			Tons.	
Bagley	175	68	157	0	17	7½	4	11	29.15	[d]3	3	43	May 98
Bailey	280	....	205	0	19	3	6	10	30.20	[c]2	4	99	Mar. 97
Barney	175	68	157	0	17	7½	4	11	29.04	[d]3	3	43	May 98
Biddle	175	68	157	0	17	7½	4	11	28.57	[d]3	3	43	...do.....
Blakely	196	....	175	1	17	9	5	11	25.58	[d]3	3	72	...do.....
Craven	146	....	147	0	16	4½	4	7	20.00	[c]2	4	[b]32	June 96
Dahlgren	146	....	147	0	16	4½	4	7	30.00	[d]2	4	[b]32	...do.....
Davis	154	....	146	0	15	4	5	10	23.41	[c]3	3	40	...do.....
De Long	196	....	175	1	17	9	5	11	25.52	[d]3	3	72	May 98
Dupont	165	....	175	0	17	8½	4	8	28.58	[d]3	4	76	Mar. 95
Farragut	279	[a]160	213	6	20	8	6	0	30.13	[c]2	4	95	June 96
Foote	142	....	160	0	16	1	5	0	24.53	[d]2	3	44	July 94
Fox	154	....	146	0	15	4	5	10	23.13	[d]3	3	40	June 96
Goldsborough	255	....	198	0	20	7	6	10	27.40	[d]2	4	89	Mar. 97
Gwin	46	....	99	6	12	6	3	3	20.88	[c]2	1	9	June 96
Mackenzie	65	....	99	3	12	9	4	3	20.11	[c]2	1	[b]15	...do.....
Manly	30	....	60	8	9	5	2	11	17.00	....	....	....	....
Morris	105	....	138	3	15	6	4	1	24.00	[d]3	3	26	June 96
Rodgers	142	....	160	0	16	1	5	0	24.49	[d]3	3	44	July 94
Shubrick	200	104	175	0	17	6	5	2	26.07	[d]3	3	82	May 98
Somers	150	....	149	4	17	6	5	10	[b]17.50	....	....	37	....
Stockton	200	104	175	0	17	6	5	2	25.79	[d]3	3	79	May 98
Stringham	340	....	225	0	22	0	6	6	25.33	[d]2	4	95	Mar. 97
Thornton	200	104	175	0	17	6	5	2	24.88	[d]3	3	85	May 98
Tingey	165	103	175	0	17	6	4	8	24.94	[d]3	3	73	...do.....
Wilkes	165	....	175	0	17	7½	4	8	25.99	[d]3	3	66	...do.....

[a] Subject to possible change.
[b] Estimated.
[c] Eighteen-inch Whitehead torpedo tubes.
[d] Eighteen-inch Whitehead torpedo tubes (long).

SUBMARINES.

Name.	Date authorized.
A-1	March, 1899
A-2	June, 1900
A-3	....do
A-4	....do
A-5	....do
A-6	....do
A-7	....do
B-1	April, 1904
B-2	....do
B-3	....do
C-1	....do
C-2	June, 1906
C-3	....do
C-4	....do
C-5	....do
D-1	....do
D-2	....do
D-3	....do
E-1	May 13, 1908
E-2	....do
F-1	....do
F-2	....do
F-3	....do
G-1	....do

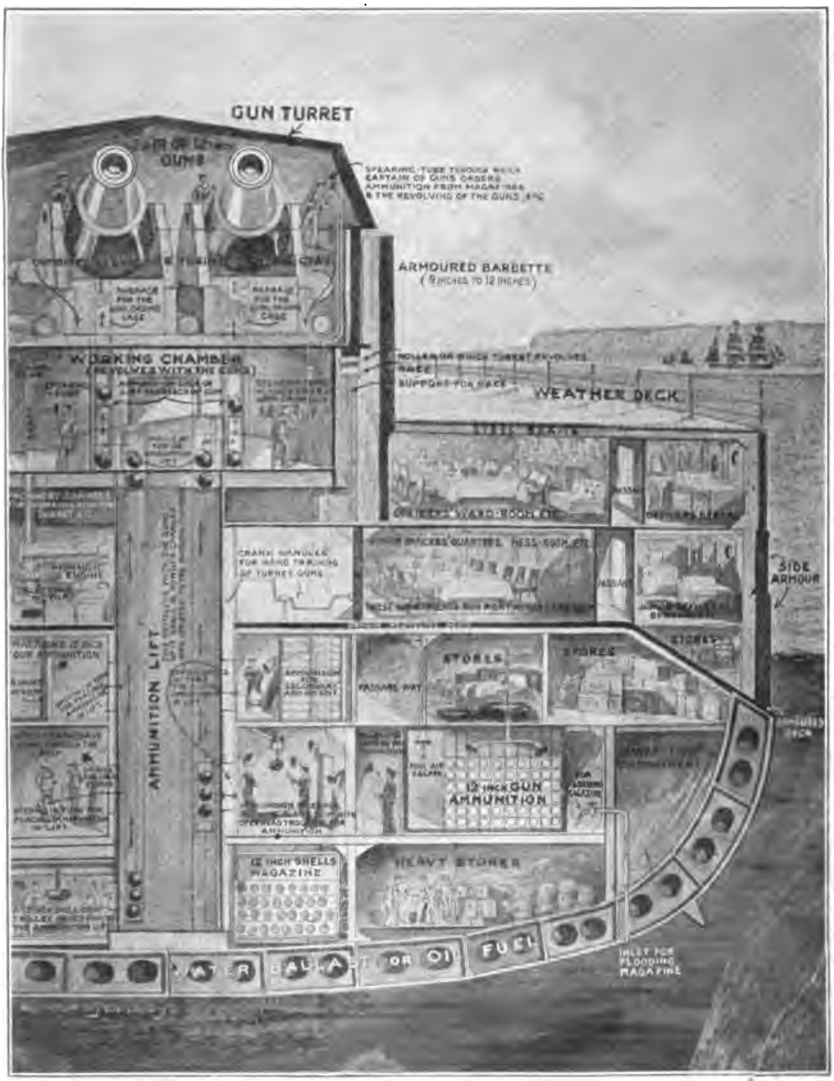
GUNBOATS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L. W. L.	Dimensions. Beam.	Dimensions. Draft aft at designed fire load.	Speed.	Guns of 4 inches and over.	Guns under 4 inches.	Coal capacity bunkers.
	Tons.	*Tons.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Knots.*			*Tons.*
Annapolis	1,010	a 560	168 0	36 0	12 9	13.17	....	6	230
Callao	243	....	115 3	17 10	7 6	b 10.00	....	6	33
Concord	1,710	a 481	230 0	36 0	16 3	16.80	4	4	354
Dolphin	1,486	a 447	240 0	32 0	17 0	15.50	2	5	265
Don Juan dé Austria.	1,130	a 366	210 0	32 0	15 8	12.20	2	c 10	204
Dubuque	1,085	568	174 0	35 0	13 4	12.90	6	6	246
Elcano	620	....	157 11	26 0	12 0	b 11.00	4	....	94
Helena	1,392	a 921	250 9	39 8	10 0	15.50	8	c 4	300
Isla de Luzon	1,030	a 314	192 10	30 1½	12 0	11.23	4	c 6	159
Machias	1,177	a 398	204 0	32 1½	13 7	15.46	8	4	261
Marietta	990	a 532	174 0	34 0	12 10	13.02	6	6	229
Nashville	1,371	a 756	220 0	38 1½	12 7	16.30	8	6	363
Newport	1,010	a 560	168 0	36 0	12 9	12.29	....	....	224
Paducah	1,085	568	174 0	35 0	13 4	12.85	6	6	d 236
Pampanga	243	....	115 3	17 10	7 6	b 10.00	....	6	33
Panay	170	....	94 10	17 3	7 6	b 8.00	....	3	20
Petrel	890	362	181 4	31 0	12 10	11.40	4	4	193
Princeton	1,010	a 560	168 0	36 0	12 9	10.64	6	6	226
Quiros	350	....	137 9	22 9	9 3	b 11.00	....	4	78
Ranger	1,261	....	177 4	32 0	....	10.00	....	....	178
Samar	243	....	115 3	17 10	7 6	b 10.50	....	6	33
Sandoval	100	....	110 0	15 6	5 10	b 8.00	....	3	16
Vicksburg	1,010	a 560	168 0	36 0	12 9	12.71	6	6	243
Villalobos	370	....	148 0	23 0	9 0	b 11.00	....	6	65
Wheeling	990	518	174 0	34 0	12 10	12.88	6	6	d 250
Wilmington	1,392	a 921	250 9	39 8	10 0	15.08	8	4	300
Yorktown	1,710	a 482	230 0	36 0	16 3	16.14	6	8	341

TRANSPORTS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L.W.L.	Dimensions. Beam.	Dimensions. Mean draft.	Speed.	Guns, 4-inch and over.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Carrying capacity. Officers.	Carrying capacity. Enlisted men.
	Tons.	*Tons.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Knots.*			*Tons.*		
Buffalo	6,000	....	e 391 6	48 3	19 5	b 14.5	6	6	1,375	29	800
General Alava	1,115	....	212 6	29 9	11 0	10.5	....	2	240	15	200
Hancock	b 8,500	....	f 450 2	45 4	24 3	....	2	....	2,428	....	192
Prairie	6,620	....	e 391 6	48 3	20 9	b 14.5	....	15	1,300	23	750
Rainbow	4,360	a 2,254	326 0	41 0	17 2	b 12.0	....	12	1,139	25	600

a Subject to possible change.
b Estimated.
c Added temporarily, two 3-pounders, R. F.
d Capacity to bottom of beams.
e Fore side of stem to center rudder stock.
f Between perpendiculars.



Courtesy of "The Illustrated London News."

THE GUN SECTION OF A "SUPER-DREADNOUGHT."

SUPPLY SHIPS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L. W. L.	Dimensions. Beam.	Dimensions. Mean draft.	Speed.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Cargo capacity.
	Tons.	*Tons.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Knots.*		*Tons.*	*Tons.*
Celtic	8,000	....	369 8	44 7	24 1	a 10.5	2	739	....
Culgoa	6,000	2,483	334 4	43 0	21 9	13.25	2	957	....
Glacier	8,325	....	353 0	46 1	25 4	12.5	1	917	....
Supply	4,325	b 2,692	342 7	43 4	19 5	9.66	10	1,029	....

HOSPITAL SHIPS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length on L. W. L.	Dimensions. Beam.	Dimensions. Mean draft.	Speed.	Guns under 4 inches.	Coal capacity bunkers (maximum).	Capacity for patients. Officers.	Capacity for patients. Men.
	Tons.	*Tons.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Knots.*		*Tons.*		
Relief	3,300	....	299 2	46 0	15 10	a 15.0	....	607	15	200
Solace	5,700	....	361 2	44 0	22 0	a 15.0	....	1,000	9	234

FUEL SHIPS.

Name.	Displacement.	Net tonnage for Suez Canal.	Dimensions. Length over all.	Dimensions. Beam.	Dimensions. Mean draft, loaded.	Speed. Loaded.	Speed. Light.	Capacity. Bunker.	Capacity. Cargo.
	Tons.	*Tons.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Knots.*	*Knots.*	*Tons.*	*Tons.*
Abarenda	6,705	2,133	325 6	42 0½	22 10	a 9.00	9.5	813	3,400
Ajax	9,250	3,320	387 6	46 6	24 8	a 10.00	11.00	500	5,000
Alexander	6,181	....	343 3	43 0	23 0	a 8.75	10.00	800	4,200
Arethusa	6,159	....	332 0	42 2	20 11	a 10.00	......	685	(d)
Brutus	6,600	b 2,314	332 6	41 6	23 1	a 10.00	......	547	4,000
Caesar	5,920	2,072	322 1	43 11	19 7	a 10.00	11.00	761	3,156
Cyclops	19,360	7,055	542 0	c 65 0	27 8	14.61	......	2,233	e 10,457
Hannibal	4,000	....	274 1	39 3	17 7	9.00	10.00	480	2,300
Hector	11,230	3,902	403 0	c 53 0	24 8	12.87	......	818	8,128
Justin	....	....	287 6	39 0	19 8	9.98	10.9	167	2,900
Leonidas	4,023	....	273 11	39 2½	17 7	8.5	9.5	200	2,200
Mars	11,230	3,902	403 0	c 53 0	24 8	12.65	......	818	8,128
Nanshan	4,950	....	300 0	39 0	21 3	10.5	11.00	400	2,900
Neptune	19,531	....	542 0	c 65 0	27 7	12.93	......	2,000	e 10,500
Nero	6,360	b 2,204	320 0	41 0	22 0	a 9.00	......	300	3,500
Orion	19,132	....	536 0	c 65 0	27 8	a 14.00	......	2,000	h 10,500
Prometheus	12,585	4,350	465 9	60 1	26 0	a 16.00	......	1,576	6,410
Saturn	f 6,220	....	297 1	40 0	22 1	11.00	......	g 386	2,400
Sterling	f 5,663	....	284 0	37 0	22 6	11.00	11.00	469	2,672
Vulcan	11,230	3,902	403 0	c 53 0	24 8	12.82	......	818	8,128

a Estimated.
b Subject to possible change.
c Molded.
d 1,085,000 gallons fuel oil.
e Also 375,000 gallons fuel oil.
f Approximate.
g Capacity to bottom beams.
h Also 773,731 gallons fuel oil.

LIST OF SHIPS OF THE UNITED STATES NAVY.

UNDER CONSTRUCTION AUGUST 1, 1913.

Name.	Displacement. (tons).	Type.	Hull.	I. H. P.	Propulsion.	Guns (main battery).	Place where building.
New York	27,000	Battleship	S.	32,000	T. S.	31	Navy yard, New York.
Texas	27.000	"	S.	32,000	T. S.	31	Newport News Ship Building Co.
Nevada	a2[illegible],500	"	S.	a24,800	T. S.	31	Fore River Ship Building Co., Quincy, Mass.
Oklahoma	a2[illegible],500	"	S.	a24,800	T. S.	31	New York Ship Building Co., Camden, N. J.
Pennsylvania	31,400	"	S.	a31,500	4 screws	34	Newport News Ship Building Co.
Battleship No. 39	31,400	"	S.	a31,500	4 screws	34	Navy Yard, New York.
Cassin	1,020	Destroyer	S.	16,000	T. S.	4	Bath Iron Works, Bath, Me.
Cummings	1,020	"	S.	16,000	T. S.	4	Do.
Downes	1,072	"	S.	16,000	T. S.	4	New York Ship Building Co., Camden, N. J.
Duncan	1,014	"	S.	16,000	T. S.	4	Fore River Ship Building Co., Quincy, Mass.
Aylwin	1,036	"	S.	16,000	T. S.	4	Wm. Cramp & Sons, Philadelphia.
Parker	1,036	"	S.	16,000	T. S.	4	Do.
Benham	1,036	"	S.	16,000	T. S.	4	Do.
Balch	1,036	"	S.	16,000	T. S.	4	Do.
O'Brien	1,050	"	S.	17,000	T. S.	4	Do.
Nicholson	1,050	"	S.	17,000	T. S.	4	Do.
Winslow	1,050	"	S.	17,000	T. S.	4	Do.
McDougal	1,020	"	S.	17,000	T. S.	4	Bath Iron Works, Bath, Me.
Cushing	1,050	"	S.	17,000	T. S.	4	Fore River Ship Building Co.
Ericsson	1,090	"	S.	17,000	T. S.	4	New York Ship Building Co.
Nereus	19,000	Fuel Ship	S.				Newport News Ship Building Co.
Kanawha	14,500	"	S.	a5,200	T. S.		Navy Yard, Mare Island.
Maumee	14,500	"	S.		T. S.		Do.
Palos		Gunboat	S.				Do.
Sacramento		"					Wm. Cramp & Sons, Philadelphia.
Monocacy		"					Navy Yard. Mare Island.
Fulton		Submarine tender					New London S. & E. Building Co.
G-2		Submarine					Newport News Ship Building Co.
G-3		"					Lake Torpedo Boat Co., Bridgeport, Conn.
G-4		"					Wm. Cramp & Sons, Philadelphia.
H-1		"					Union Iron Works, San Francisco.
H-2		"					Do.
H-3		"					Seattle Construction & Dry Dock Co.
K-1		"					Fore River Ship Building Co., Quincy, Mass.
K-2		"					Do.
K-3		"					Union Iron Works, San Francisco.
K-4		"					Seattle Construction & Dry Dock Co.
K-5		"					Fore River Ship Building Co., Quincy, Mass.
K-6		"					Do.
K-7		"					Union Iron Works, San Francisco.
K-8		"					Do.
L-1		"					Fore River Ship Building Co.
L-2		"					Do.
L-3		"					Do.
L-4		"					Do.
L-5		"					Lake Torpedo Boat Co., Bridgeport, Conn.
L-6		"					Craig Ship Building Co., Long Beach, Cal.
L-7		"					Do.
M-1		"					Fore River Ship Building Co.
Melville	7,150	Destroyer Tender	S.		1	8	New York Ship Building Co.
Bushnell	3,580	Submarine Tender	S.		1		Seattle Construction & Dry Dock Co.

 a Estimated.

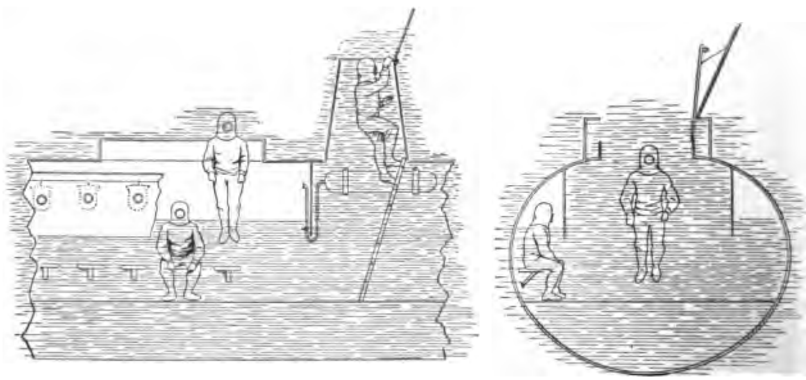
This table is of August 1, 1913; changes are constantly occurring. Thus the "Arkansas" was turned over to the Navy Department on August 29, 1912. The "Jouett" made 33.7 knots and is the fastest boat in the Navy.

The active list of the Navy, January 1, 1913, comprised 1,791 commissioned and 452 warrant officers, not including 870 Midshipmen of the Naval Academy. There were 496 commissioned and 122 warrant officers on the retired list. The enlisted strength allowed by law is 51.500 men and apprentice seamen.

UNITED STATES MARINE CORPS.

The United States Marine Corps, serving generally under the direction of the Secretary of War, is an independent branch of the military service of the United States. The corps may be detached by order of the President for service with the army but its principal duties are in connection with the navy as follows: To garrison the different navy yards and naval stations, both within and beyond the continental limits of the United States; to furnish the first line of mobile defense of naval bases and naval stations beyond the continental limits of the United States; to man such naval defenses, and to aid in manning, if necessary, such other defenses as may be erected for the defense of naval bases and naval stations beyond the continental limits of the United States; to garrison the Isthmian Canal Zone, Panama; to furnish such garrisons and expeditionary forces for duties beyond the seas as may be necessary in time of peace; to serve on board all battleships and armored cruisers of the navy, and such other vessels as may be directed, in detachments of not less than 8 per cent. of the strength of the enlisted men of the navy on said vessels; in case of disturbances in foreign countries marines are landed to protect American interests.

The authorized strength of the Marine Corps is 333 officers and 9,521 enlisted men. On June 30, 1911, there were 330 officers and 9,454 enlisted men in the service. The term of enlistment in the Marine Corps is four years and applicants must be 19 years of age and not over 35. Minors must have consent of parents or guardian. Apprentices to learn the drum and trumpet are enlisted between the ages of 15 and 17 with the consent of parents or guardian but they serve only during minority. All recruits must be able-bodied and of good character and after acceptance are sent to a recruit depot for instruction for three months.



SUBMARINE HELMET FOR THE ESCAPE OF IMPRISONED SAILORS IN SUBMARINES WHICH CANNOT RISE OR WHICH HAVE BECOME "HOLED." NOTE THE AIR TRAP.

SUBMARINE DISASTERS.

The important submarine disasters which have resulted in the loss of life are:

1904, March 13—British submarine "A1" sunk by collision off the Isle of Wight, England. 11 men killed.

1904, June 2—Russian submarine "Delfin" sank at her moorings in the Neva. 21 men drowned.

1905, February 10—British submarine "A5" blew up in Queenstown harbor. 4 men killed and 7 seriously injured.

1905, June 8—British submarine "A8" sank in Plymouth Sound. 15 men killed.

1905, July 6—French submarine "Fafardet" filled with water at Bizerte, Tunis, and could not rise. 12 men drowned.

1906, October 17—French submarine "Lutin" sank off Bizerta after an explosion. 15 men killed.

1909, April 26—Explosion aboard the Italian submersible Foca in the Bay of Naples. 8 men killed.

1909, July 14—British Submarine "C11" sunk by collision. 13 men drowned.

1909, June 13—Russian submersible "Kambala" rammed by warship off Sebastopol. 15 men killed.

1910, May 26—French submarine "Pluviose" struck by steamship. 28 men killed.

1910—Japanese submersible "No. 6" dived and could not get to the surface again. 15 men killed

1910, August 6—British submarine "A1" again suffered by an explosion whch mortally injured 7 men.

1911, January 18—German submersible "U3" struck on the bottom of the harbor of Kiel. 27 men shot to the surface in suits made for the purpose. Only 3 men killed.

1912, February 2—British submersible "A3" struck by ship off Isle of Wight. 14 men killed.

1912, June 8—French submarine "Vendémiare" run down by battleship St. Louis and sunk. 23 men killed.

1912, Oct. 4—British submarine "B2" run down by steamship Amerika. 15 men killed.

UNITED STATES NAVAL ACADEMY.

NOMINATION.

The students of the Naval Academy are styled midshipmen. Two midshipmen are allowed for each Senator, Representative, and Delegate in Congress, two for the District of Columbia, and five each year from the United States at large. The appointments from the District of Columbia and five each year at large are made by the President. One midshipman is allowed from Porto Rico, who must be a native of that island. The appointment is made by the President, on the recommendation of the governor of Porto Rico. After June 30, 1913, each Senator, Representative, and Delegate in Congress will be allowed to appoint but one midshipman instead of two.

The course for midshipmen is six years—four years at the academy, when the succeeding appointment is made, and two years at sea, at the expiration of which time the examination for final graduation takes place.

Midshipmen who pass the examination for final graduation are appointed to fill vacancies in the lower grade of the line of the Navy; and occasionally to fill vacancies in the Marine Corps and in certain of the staff corps of the Navy.

Candidates allowed for congressional districts, for Territories, and for the District of Columbia must be actual residents of the districts or Territories, respectively, from which they are nominated. All candidates must at the time of their examination for admission, be between the ages of sixteen and twenty years. A candidate is eligible for appointment on the day he becomes sixteen and is ineligible on the day he becomes twenty years of age.

Candidates are required to be of good moral character, physically sound, well formed, and of robust constitution. Attention will also be paid to the stature of the candidate, and no one *manifestly* under size for his age will be received at the academy.

Full information in pamphlet form can be obtained by addressing the Secretary of the Navy, Washington, D. C.

FORWARD TURRET OF THE U. S. BATTLESHIP "MINNESOTA."

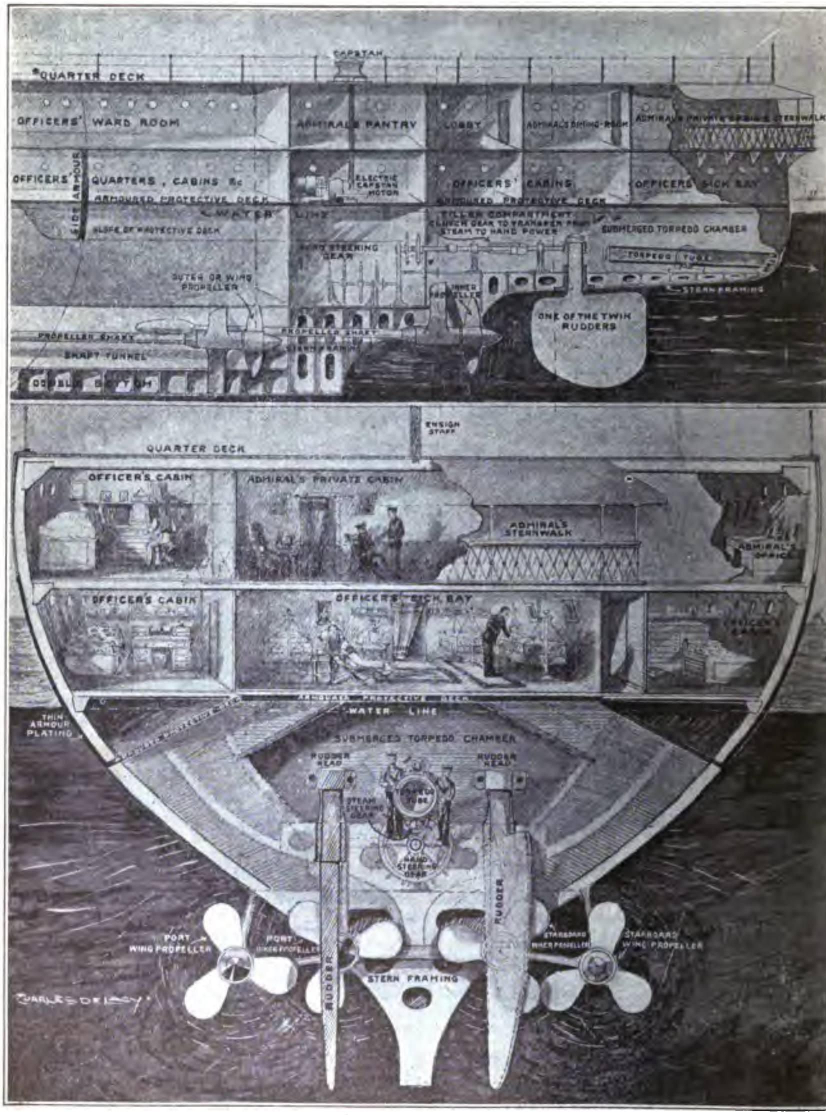
Above the 12-inch guns is the Morris tube and mechanism used in training gun-pointers.

NAVY AND NAVAL MILITIA.

At present there are 23 States and the District of Columbia supporting Naval Militia organizations aggregating a force of 615 officers and 7,185 men, a total of 7,800 militiamen, organized under the laws of the various States bordering upon the seas and upon the Great Lakes. The actual strength of the personnel of the Navy, on June 30, 1912, was 3,114 officers and 46,651 enlisted men, a total of 49,858. In the Marine Corps on June 30, 1912 there were 319 officers and 9,567 men, a total of 9,886 men.

COST OF SHIPS OF THE UNITED STATES NAVY.

The cost of some of the ships of the United States Navy, exclusive of the cost of armor and armament, is as follows: Armored ships, "Arkansas," $4,694,680; "Connecticut," $3,989,990; "Florida," $6,223,600; "Kansas," $4,167,990; "Louisiana," $3,989,990; "Minnesota," $4,112,715; "Montana," $4,726,968; "New Hampshire," $7,792,000; "Nevada" (building), $10,714,000; "North Carolina," $4,726,968; "North Dakota," $4,380,565; "Oklahoma" (building), $10,714,000; "Pennsylvania" (building), $7,402,400; "Tennessee," $4,726,968; "Texas," $5,678,420; "Vermont," $4,182,000; "Washington," $4,726,968; "Wyoming," $4,673,700.



Courtesy of "The Illustrated London News."

THE STERN SECTION OF A "SUPER-DREADNOUGHT."
Longitudinal above.—Transverse below.

CHAPTER XVI.

AVIATION.*

By Dr. A. F. Zahm.

EVOLUTION OF AIR CRAFT.

The science of aerial locomotion divides naturally into four parts—two relating to aerostation, or the science of buoyant air ships; two relating to aviation, or the science of flying machines. Each of these main branches may in turn be subdivided into two parts, one relating to power craft, the other to passive or motorless craft. Thus in aerostation we have power-driven or dirigible balloons, and we have free balloons which, being devoid of motive power, drift helplessly with the wind; while in aviation we have the various types of power-driven flying machines and the various forms of passive gliding or soaring machines, which travel through the air by the force of gravity, or by virtue of previously acquired momentum, or by the aid of favorable wind currents. These four branches all have their votaries, all have their specialized types of aerial vehicles; all save one form the basis of special and rapidly growing industries, involving, certainly in the case of power craft, millions of dollars of capital. The least successful of the four types of air craft is the soaring or gliding machine, because it has not yet received adequate attention; but when fully developed it may become of considerable importance among the various kinds of aerial locomotion. We shall consider briefly the growth and present status of these various popular and captivating modes of travel.

GROWTH OF PASSIVE BALLOONS.

The invention of the passive balloon is usually accredited to those two French brothers, Joseph and Stephen Montgolfier, who in June, 1783, first launched publicly a large paper bag inflated with hot air. But in truth they have to share the honor with several others. Prof. Charles, that same summer, constructed and publicly launched the first hydrogen balloon; Cavallo, in England, a year previously, made hydrogen soap bubbles which rose beautifully in the air; and Dr. Black, half a decade earlier, proposed to make a thin light vessel rise in the air by inflating it with hydrogen, a gas then recently discovered by Cavendish. The use of coal gas for inflation, constituting an important advance, though not an invention, was made in 1821 by George Green, of England.

The chief constructional features and navigation appliances of the practical gas balloon were devised or introduced by Prof. Charles and Mr. Green. Charles first covered the gas bag with a net from which the car or basket was hung by means of suspension ropes attached to a concentration ring at the bottom of the net. He invented the balloon valve and used it, together with sand ballast, to regulate his elevation. He also introduced the balloon anchor to arrest the balloon on reaching earth, the barometer for showing the altitude, dissolved rubber varnish to render the envelope impermeable. Green gave the balloon its modern net with small suspension ring, and first used the drag rope, trailing down from the basket along the earth's surface, to maintain an even altitude. After these two pioneers came John Wise, of America, who first used the ripping panel, a ribbon covering a vertical seam in the upper half of the envelope in such a way that, on landing, it can be quickly jerked off, to allow the bag to collapse on the ground instantly.

Some very large passive balloons have been made for amusement or scientific exploration, but these could

FLIGHT OF DIRIGIBLE ACROSS COUNTRY.

easily be surpassed in size. The largest hot air balloon, *La Flesselle*, launched at Lyons in 1784, measured 100 feet in diameter by 130 feet high. Comparable with this in size was the hydrogen balloon, *The Prussia*, of 300,000 cubic feet volume, with which Prof. Berson and Dr. Süring rose to the highest elevation yet attained by man—35,600 feet, or nearly seven miles. The largest hydrogen balloon, cubing 450,000 feet and carrying forty passengers at once, was used by Giffard to give sightseers a view of Paris at the Exposition of 1878.

The longest voyage in a spherical balloon yet recorded is that of Emile Dubonnet and P. Dupont. Sailing from La Motte-Brenil, France, Jan. 7, 1912, they landed next day at Sokolowska, Russia, after a continuous journey of 1954 kilometers, or 1216 miles. The previous world's record was held by Count de la Vaulx. Starting from Vincennes, France, in October, 1900, he landed at Korosticheff, Russia, having traversed 1,193 miles in 35¾ hours. A close second to this record was made by A. R. Hawley in his spherical balloon *America*, aided by Augustus Post, in the Gordon Bennett International Balloon Race of 1910. Sailing from St. Louis, October 17, they drifted 1,173 miles from their starting point, and landed in a great forest at Peribonka River, North Lake Chilogoma, Canada, where they were lost for several days.

GROWTH OF POWER BALLOONS.

In the year succeeding the invention of the passive balloon the Robert brothers, who had been constructors for Prof. Charles, and had first made rubber varnish, devised and built the first elongated dirigible. This was a

melon-shaped silk bag, 52 feet long by 32 feet in diameter, supporting a longish car propelled by six silken oars and guided by a silk rudder. It was a successful dirigible, but too slow to be of any value, for it was driven by hand power and traveled at only a walking pace.

Gen. Meusnier that same year devised a similar shaped balloon, but having coaxial screw propellers between the car and bag, to be actuated by eighty men. The hull comprised a melon-shaped hydrogen bag inside a slightly larger air bag always pumped full and taut so as to resist deformation. Stablizing planes placed on the outside, as in the modern dirigible, were to control the poise of the vessel. The buoyant hull and suspended car were to be kept in alignment by suitably inclining and crossing the suspension cords. The Meusnier design was indeed a creation of fundamental importance which, for want of engine power, had to wait upwards of a century before it could be practically employed.

The first torpedo-shaped balloon was Jullien's model of 1850, made of gold beaters' skin, measuring 23 feet long and weighing 2½ pounds. It was driven by clock-spring-actuating twin propellers at either side of its bow, and had a double rudder at its stern. It could navigate steadily against a moderate wind. Aerodynamically this tiny model excelled in design all other dirigibles produced during the first century of aeronautics, and was the harbinger of the swift modern air cruisers of the most effective shape and equipoise.

During the remainder of the nineteenth century steam, electric and gas motors were in turn applied to the propulsion of airships, but with meager success. In 1852 Giffard, in a spindle-shaped balloon 143 feet long by 39 feet in diameter, and driven by a three-horse-power steam engine actuating an 11-foot screw, voyaged from Paris at a sustained speed of six miles an hour through the air and with good control. In 1872 the German Haenlein, with a cucumber-shaped coal gas balloon 164 feet long by 30 feet in diameter, driven by a gas engine taking fuel from the envelope, and actuating a single screw, attained a speed of ten miles per hour. In 1884 Renard and Krebs, in a torpedo-shaped dirigible 165 feet long by 27.5 in major diameter, driven by an electric battery motor, actuating a screw propeller, made the first return voyage against a moderate wind. The vessel showed excellent control, attained an average speed of 14.5 miles an hour, and was of model workmanship; but for lack of power it was practically abandoned till the advent of the automobile engine.

In 1898 Santos-Dumont, emulating the German Wölfert, who in 1880 first attempted to drive a dirigible with a benzine engine, sailed aloft in a spindle-shaped balloon 82 feet long by 11 feet in diameter, driven by a motor-cycle engine of 3½ horsepower, carried in the car suspended beneath the envelope. Finding this vessel manageable and swift enough to make his clothes flutter, and amply rigid when its balonet or internal air cell was properly inflated, he in subsequent years built fifteen more dirigibles of various designs. The speed of the best of these varied from fifteen to upwards of twenty miles per hour. They may be considered as the successful prototypes of the great non-rigid air cruisers which so quickly followed in France, Germany and elsewhere.

In 1900 Count Zeppelin, emulating the Austrian, Schwartz, who in 1897 first tentatively drove a rigid metal balloon with a petrol motor, launched the first of his huge rigid dirigibles. Its hull, which was framed of aluminum and contained seventeen compartments holding buoyant hydrogen bags, measured 416 feet long, 38 feet across, cubed 400,000 cubic feet, weighed nine tons, and had a displacement of ten tons. It was driven by two petrol engines actuating four screw propellers mounted directly on the underside of the hull, two forward and two aft. Subsequently larger vessels, with passenger compartments running along the bottom of the hulls, accommodating twenty to thirty passengers, were built and powered with engines adequate to attain velocities of over forty miles per hour. The large vessels have required for inflation nearly 700,000 cubic feet of hydrogen, have weighed some fifteen tons and lifted four or five tons of useful load, have voyaged continuously twenty to forty hours, and have made continuous journeys of 500 to 1,000 miles in length. *Zeppelin X.*, called the *Schwaben*, a regular transportation airship with accommodations for 24 passengers, made in

COUNT VON ZEPPELIN'S GREAT WORK EXPRESSED IN FIGURES.

Airship	Year	Gas capacity in cubic feet	Number of gas-tight compartments	Length in feet	Breadth in feet	Number of engines	Total horse-power	Number of propellers	Speed in miles per hour
I.	1900	399,000	17	419.9	37.25	2	29.4	4	17.4
II.	1905–06	399,000	16	419.9	37.25	2	170	4	27 ?
III.	1906–07	399,000	16	419.9		2	170	4	28
	1908–09				37.25			4	29.2
	1912	427,300	17	446.2		2	210–230	4	33 ?
IV.	1908	547,400	17	446.2	42.65	2	210	4	27–29
V.	1909	547,400	17	446.2	42.65	2	210	4	28.6
VI.	1909–10	547,400	17	446.2	42.65	2	220	4	30.3
						3	345	6	33.6
	1910	565,000	18	472.4	42.65	3	345–360	4	32 ?
VII.	1910	681,600	18	485.6	45.93	3	400	4	34.8
VIII.	1911	681,600	18	485.6	45.9	3	100	4	35
IX.	1911	600,000	16	433.1	45.9	3	450–460		48
		640,000	17	459.3					48
X.	1911	681,600	18	485.6	45.9	3	450–460		44
XI.	1912	681,600	18	485.6	45.9	3	450–460		45

1911 over 100 trips, aggregating 8,500 miles and carried 2,300 persons. Regular excursion tickets can now be purchased in New York by outgoing tourists which, on presentation at the Zeppelin airport at Friedrichshafen, entitle the bearer to an airship voyage, usually conducted on schedule time, over some of the most beautiful and interesting regions of Germany and with the accommodations of a modern palace car. The above table gives the dimensions, power and speed of Count Zeppelin's various dirigibles up to 1912.

Rivaling these unique rigid dirigibles, at least in celerity and control, if not in size, are the great non-rigid dirigibles of Gross and of Parseval in Germany, of Clement and of Julliot in France, and of the national government in Italy. These all comprised elongated silk bags, more or less whale shaped, from which were suspended the car carrying the crew and passengers and the mechanism of propulsion and control. Scores of these large non-rigid dirigibles sprang into being for sportive or military use, powered sufficiently to run all day, to voyage hundreds of miles, and to attain speeds of thirty to forty miles an hour. The *Parseval* in particular has an excellent reputation for the speed and precision with which it carries passengers on schedule time above the city of Berlin and over some of the most interesting historical places in Germany.

GROWTH OF PASSIVE FLIERS.

For many decades two kinds of passive flight have been recognized in nature, and have been understood to be achievable by man. One is volplaning, or gliding by aid of gravity or acquired momentum; the other is soaring, or gliding by force of the wind without loss of altitude. Human volplaning has been so far perfected as no longer to be a novelty; human soaring is a much neglected art, though doubtless capable of very great development.

The permanent art of passive man-flight dates from Otto Lilienthal's experiments near Berlin in the early nineties of the last century, though long previous to that time some wonderful feats of gliding and soaring, of both men and models, were reported by reliable witnesses. Lilienthal made numerous glides several hundred feet in length, down hill slopes, sometimes pausing in the air or rising considerably above his launching place. Sometimes also he wheeled about and returned nearly to his starting point. At first he used a monoplane glider, then a biplane, in each case controlling his poise in the air by shifting his weight as he hung by his arms underneath the kite-like motorless craft. He finally prepared to convert his glider into a dynamic aeroplane by

adding a light engine; but in an unlucky glide his structure gave way and dropped him to his death among its tangled wreckage—the protomartyr!

Lilienthal's work was continued by various disciples, mainly American, who perfected his structural designs and means of balance. Chanute and Herring in the latter nineties developed the familiar Chanute biplane, whose Pratt truss arrangement of two superposed concave surfaces is now commonly used in many types of power aeroplanes. They, too, maintained their aerial poise by shifting their suspended weight. Early in the twentieth century the Wright brothers, of Ohio, and Prof. Montgomery, of California, introduced in practice the modern dynamic system of controlling an aeroplane in passive flight without shift of the operator's weight, though, broadly speaking, their devices had been previously invented and published by various other votaries of aviation, as will be shown later.

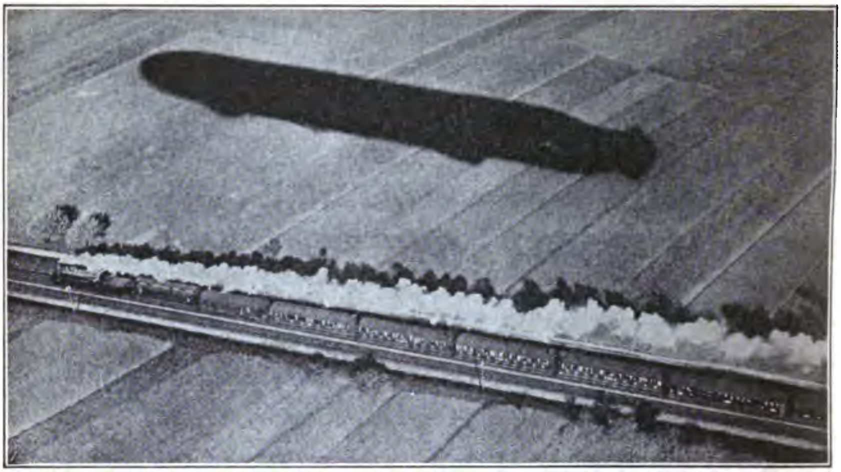
The records for volplaning have not been kept with much care, but some are well attested. Lilienthal, Chanute and Herring and the Wrights all performed short flights of usually less than 1,000 feet, along sloping ground. Montgomery in 1905 launched from a balloon 4,000 feet in air a glider bearing on its back a dauntless aeronaut, Maloney, who by means of wing warping and a double rudder guided it, with many a playful dip and wheel, securely down to a designated spot, where he landed in safety. With a like aerial glider another Montgomery aeronaut cut corkscrews in the air. The record for volplaning in a power machine, which really becomes a glider when the motor stops, is held by Lincoln Beachy, who during the Chicago meet of 1911, glided sheer down to earth in a Curtiss biplane from an elevation of 11,642 feet.

The records for soaring are briefer, and some are not so well attested. In 1859 Capt. Le Bris, piloting a glider patterned after an albatross, soared 300 feet high and descended safely to earth. This on the authority of De la Landelle, who wrote a history of aeronautics, published in 1884, and who had the account from Le Bris's neighbors. Mouillard, nearly twenty years ago, soared 138 feet over a prairie after an initial run and jump across a roadside ditch with a glider strapped to his waist. Many recent aeroplanists have been carried well upward by rising wind currents. During the gliding experiments of Chanute and Herring one of the operators was raised by the wind some forty feet high, then landed almost in his tracks without serious shock. Lateral glides along the hillside were also made, one forty-eight seconds in length, which showed the possibility of patrolling to and fro in such places. Mr. Atwood relates that while flying over a mountainous country he once encountered an upsloping current which lifted him over 1,000 feet high. Orville Wright was supported on such an ascending current above a hill slope for nearly ten minutes, sometimes stationary, again gliding forward or backward, and sometimes rising to a considerable elevation above the starting point. Mr. Ludolph Schroeder relates that in May, 1908, he launched from the Palisades, on the Hudson, a riderless glider six feet long, made of one-inch pine boards, and saw it caught up by the oncoming wind and carried hundreds of feet high and many thousand feet to the west of the river.

GROWTH OF POWER FLIERS.

From time immemorial aviation had been cultivated in a crude, tentative and unpromising fashion before any noteworthy and definite progress began to be recorded. Such progress dates from the first decade of the nineteenth century. Prior to that time many volant devices had been tested, and some little flying had been achieved, but no permanent and substantial contribution to either the science or art of dynamic flight had been transmitted to succeeding generations.

England made the first substantial contribution to the science of aviation. In 1809 and 1810 Sir George Cayley published in Nicholson's Journal, now the Philosophical Magazine, a paper describing his experiments with large aerial glider models, and setting forth the principles of design conducive to inherent stability. He clearly conceived and explained the advantage of placing the wings of an aeroplane at a dihedral angle to one another, as soaring birds do, to maintain a pendulous lateral equilibrium, and he employed that device. He anticipated by sixty years the Frenchman, Pénaud,



THE OFFENBURG-FREIBURG EXPRESS RACING WITH AND SNAPSHOTTED FROM THE ZEPPELIN AIR-SHIP "SCHWABEN."

Courtesy of "The Illustrated London Times."
THE AIR-SHIP "ZEPPELIN III." FLYING OVER THE ELBE DURING A SEVERE THUNDERSTORM.

in providing for fore and aft equilibrium by setting the tail, or horizontal rudder, at a slightly negative angle, so that when the flier plunges too swiftly downward the increasing pressure on top of its tail causes the bow to rise until the speed and course of flight attain their natural uniformity. From the weight and observed rate of descent of his glider model he computed the work of gravity expended in its propulsion, and thence proceeded to estimate the power and weight of an artificial motor that should drive a dynamic aeroplane. Finding the cumbrous steam engine of his time inadequate, he conceived the idea of employing an internal combustion engine in its place, thus anticipating the modern aeronautical motor. Indeed, the contributions to the science of flight made by Sir George Cayley seem to be the most radical, fundamental and original of any that have been recorded up to the present time by the promoters of mechanical flight.

The English engineer, Samuel Henson, made the next substantial advance in the devices and principles of aviation. He had not the originality and scientific method of his illustrious predecessor, Cayley; but, as patent lawyers phrase it, he "reduced to practice" his remarkable conception of a dynamic aeroplane. In 1842, he patented a monoplane having all the mechanical features essential to successful flight. It was provided with a horizontal and a vertical rudder operable by the pilot to control the poise of the flier about corresponding axes, and was furnished with a vertical keel surface, placed above the center of gravity, to aid in steering and to lend inherent lateral stability, on the principle of the side planes in a box kite. Henson's monoplane was thus equipped as well for security of poise and control in flight as a practical modern aeroplane of the Voisin type. Its wings, which were of very efficient shape, were trussed and covered very much like those of a modern monoplane. The machine was to be propelled by an engine actuating twin screws, like the successful models of Tatin, Langley and others of later date; and was provided with a three-wheel chassis for starting and landing, as commonly practised nowadays by machines of the Curtiss type.

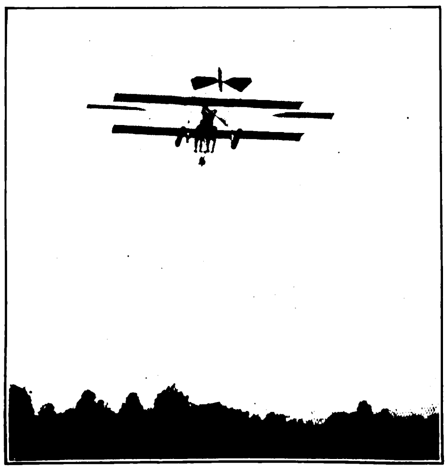
Thus, while Cayley first set forth the scientific principles of flight, Henson may be called the first practical inventor of the commercial aeroplane, in so far as he first disclosed and patented an invention capable of sustained flight with passengers. His system of control was the same in principle as that of the early Voisin machine in which Paulhan once flew 82 miles in gusty weather. For lack of suitable motive power, however, Henson wisely refrained from constructing a full-size machine.

In 1846 Stringfellow, who had previously experimented with Henson, built a steam model aeroplane of about the size of a large soaring bird, and weighing altogether, with fuel and water, 6½ pounds. A special feature of this model was that its main surfaces were sloped like the wings of a bird, slightly concave below and feathered toward the back; thus making it more efficient and stable in flight. With a good head of steam, and propellers whirling, the model ran down a stretched wire, leaped into the air "and darted off in as fair a flight as it was possible to make, to a distance of about 40 yards." This was the first power-driven aeroplane model to fly successfully and balance itself in the air.

In 1868 another Englishman distinguished in aviation science, Mr. F. H. Wenham, published a paper setting forth the aerodynamic advantages of driving aeroplanes long edge first, to increase their lift, and of placing several surfaces one above the other to secure ample support with moderate wing spread. He may thus be regarded as the first inventor of a biplane or multiplane. He reduced to practice these ideas by patenting a multiple surface aeroplane, and making a tentative glider on which the pilot should lie prone in flight.

Profiting by this new principle of construction and support, Stringfellow in 1868 built a triplane model propelled by twin screws actuated by a high pressure steam engine contained in a double-wedge shaped car, which car moreover served as a steadying keel. The sustaining part of this machine comprised three superposed parallel planes held rigidly in place by vertical posts and oblique tie wires. He was thus first to use the Pratt truss arrangement common to the biplanes and multiplanes of the present day. The little model flew in the Crystal Palace, London, but with in-

CURTISS MILITARY HYDRO-AEROPLANE.



CURTISS BIPLANE.

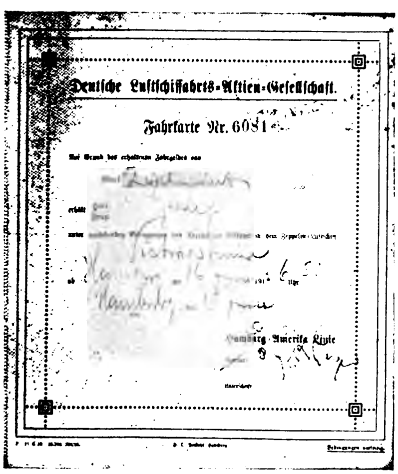
FARMAN FLYING OVER MÉZIÈRES.

BOLAND BIPLANE.

ROBINSON IN CURTISS HYDRO-AEROPLANE.

different success. It now hangs from the ceiling of the American Museum at Washington, along with other historical model fliers.

In 1884, Horatio Phillips, of England, who had tested a great variety of model wing forms in a wind-tunnel, patented a shape very like the wing of a good modern aeroplane. He was the first to show the world quantitatively, by published researches and by actual use in experimental aeroplanes, the superior merits of arched surfaces, both single and superposed. Phillips' wing-shape has been adopted with various modifications in many notable aeroplanes of recent years. Investigations leading to similar results were conducted in Germany, by Otto Lilienthal and his brother. Their results were published in the succeeding decade, and amply tested in several man-carrying gliding machines, both monoplanes and biplanes, with which many hundred successful glides down hill slopes were made. Finally Octave Chanute, the distinguished American railway and bridge engineer, aided by Mr. A. M. Herring, perfected the two-surface glider, and developed the finished type of structure now commonly known as the Chanute biplane. A particular feature of the original Chanute glider for securing inherent lateral stability were the vertical side planes,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first used by Lawrence Hargrave, inventor of the box kite.

The now very commonly used system of controlling the poise of an aeroplane in flight was invented and disclosed many times before the advent of practical flying. In 1868 Matthew Boulton of England first gave to the world a system of control comprising a vertical rudder, a horizontal rudder, and a pair of reverse turning ailerons operable by hand or automatically. He was therefore the original inventor of the three-torque, or three-rudder, system in aviation. In 1893 the system of torsional wings together with vertical and horizontal rudders for controlling flight was publicly described by the present writer* in America and by Felix Ader in France, who embodied it in his monoplane. This system was practically employed, in one form or another, by the Wright brothers and by Prof. Montgomery, early in the twentieth century. The first public demonstration of the system was made by Montgomery as early as April, 1905. In 1899 Hugo Mattullath, of New York, drew up patent specifications, later allowed by the U. S. Patent Office, for a hydroaeroplane with two floats and a control system comprising a vertical rudder and aileron-like surfaces on either side of his machine fore and aft. The common aileron system seems to have been first practically used and indeed reinvented early in 1908, by the Aerial Experiment Association, at Hammondsport, N. Y.

As to the first human power flights, Ader in 1890 is reported to have flown 150 feet in a wheel-mounted monoplane driven by a steam engine actuating twin screws, and controlled in flight by independently operable horizontal and vertical rudders and reversely warpable wing tips. The construction of his machine is well known, but its flights are not well authenticated. Maxim three years later rose from a track in a steam driven multiplane, the largest yet built, weighing 3.5 tons and lifting more than a ton of extra load. It had horizontal and vertical rudders, but no torsional wings and, because of its low center of

*The writer also applied the system in the winter of 1903, to the design, for the American Transit Co., of a wheel mounted aeroplane with stream-line body enclosing the aviator and having transparent walls.

gravity, it was too unsteady for practical flight. Owing to their excessive waste of fuel and water, both the Ader and the Maxim power plants were unsuitable for long voyages in the air.

The first dynamic aeroplane of adequate stability and power to carry a man in prolonged flight was that of Dr. Langley, completed in 1903. The famous secretary of the Smithsonian Institution and his assistant, Charles M. Manley, by designing and constructing a suitable motor, surmounted the last formidable, the hardest, the centuries old obstacle in the development of an aeroplane adapted to human flight. This was a gasoline engine of fifty-two brake horse power weighing two hundred pounds and competent to run for many hours under full load. Moreover they had provided for both inherent stability and effective manipulation of the machine in flight. The pilot could control the poise and course by several devices; he could shift his weight some feet in either direction; he could elevate and depress the rear double rudder, which when untouched insured steady longitudinal poise on the principle introduced by Pénaud; he could steer to right and left by turning about its vertical axis a wind-vane rudder below and rearward of the boat. The wings were set at a dihedral angle, the lines of lift, propeller thrust and forward resistance passed through the centroid, or near it, thus providing for projectile and gravitational stability.

This machine was nearly a duplicate, on a four-fold scale, of the gasoline driven model which during the same year had flown many times with good inherent equilibrium, and this model in turn closely resembled in aerodynamic features the steam-driven model which flew and balanced itself successfully above the Potomac river in 1896. Naturally therefore, it was expected that, with a pilot on its back, the large machine would fly even more securely than its miniature prototype. Unfortunately this elaborately perfected monoplane met with an accident in launching, thereby bringing upon its inventor unmerited censure, and depriving him of the credit of having produced the first successful passenger aeroplane. But it is now understood by aeronautical engineers that his large machine, as well as the model, had all the elements essential to prolonged flight with good inherent stability, and with sufficient manual control for practical service in moderate weather. Moreover Bleriot, in a tandem monoplane closely patterned after Langley's, made a successful flight in 1907.

Langley's culminating labors in aviation, though apparently thwarted in the hour of imminent triumph, left his colleagues in both hemispheres undaunted and optimistic. A score of sanguine experimentalists were now at work in either hemisphere. Archdeacon in France had offered a prize of 3,000 francs for the first person to fly publicly 25 meters, with a maximum descent not exceeding one-third of the range. Bleriot, Santos-Dumont, Voisin, Ferber, Levavasseur, Esnault-Pelterie, Phillips, Cody, Ellhamer, abroad, the Wrights, Berliner, Graham Bell, Montgomery in this country, and many others who eventually built successful aeroplanes, were now pursuing aviation with unwavering confidence. The Wrights, in this country, and Phillips abroad were the first to achieve a measure of success; the former in December, 1903, when one of them flew for fifty-nine seconds in a wheelless biplane driven by a gasoline motor; the latter in 1904, when he flew across a field in a wheel-mounted gasoline-driven multiplane. But these were private flights of no avail to the profession generally, except that the report of the Wright experiments stimulated others to increased activity which soon led to success in several localities, while the Wrights were still concealing their apparatus. The first flights made before the technical public were, in Europe, those of Santos-Dumont and Ellhamer, in America, those of the Aerial Experiment Association at Hammondsport, New York. The latter was the first to demonstrate before technical men the merits of the three-rudder system of control on a dynamic aeroplane. Henceforward the art advanced with prodigious strides, under the munificent patronage of a marveling and delighted public.

Among the recent improvements employed in present-day aeroplanes are the wheeled-landing skids, the various automatic stabilizing surfaces and the aquatic appliances. Landing skids were familiar in the art during the last decade of the nineteenth century, and skids combined with wheels, to which they were elastically attached, were introduced by Henri Farman in

1909. Among the automatic stabilizing surfaces may be noted, in addition to the rigid dorsal fin first patented by Henson, the elastic rearward protruding wing-tips and the elastic tail introduced by the Austrian engineer, Etrich, and the pendulum-operated controlling surfaces devised and tried by various experimentalists, but not yet generally adopted. The aquatic devices proposed many years ago, and first practically employed by Curtiss in America, which enable an aeroplane to rise from the water and land thereon, constitute perhaps the most radical modern improvement in aviation, virtually adding a new and very important domain to the empire of dynamic flight.

Following the successful inauguration of the flying-machine for sportive and military uses, special types of aeroplanes were rapidly developed for the attainment of special ends. Machines of stream-line form with powerful motors, and limited wing surface, were used to attain high speed, as the Nieuport, Deperdussin, Esnault-Pelterie, etc.; machines of large wing surface and great power were used to carry large burdens, etc. Without presenting the details of construction, the following tables exhibit the marvelous progress of the art as told by the records of well attested flights.

THE $2,400 SCIENTIFIC AMERICAN TROPHY WON BY GLENN H. CURTISS. (Page 456.)

AMERICAN AVIATION RECORDS (IN CLOSED CIRCUIT, WITHOUT STOPS).

A. *SPEED.*

1. *Time on a Given Distance.*

Distance Kilo.	Distance Miles	Holder	Place	Date	Machine	Motor	Time
(a) Aviator Alone.							
5	3.107	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	1'43.38"
10	6.214	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	3'27.87"
15	9.32	Jules Vedrines	Chicago, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	5'11.58"
20	12.427	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	6'55.95"
30	18.641	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	10'32.51"
40	24.855	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	14' 3.59"
50	31.068	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	17'34.88"
100	62.137	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	35'16.65"
150	93.205	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	53' 4.73"
200	124.274	Jules Vedrines	Clearing, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	1 hr. 10'56.85"
250	155.342	St. C. Johnstone	Mineola, N.Y	July 27, 1911	Moisant	50 Gnome	3 hr. 32'562/5"
(b) Aviator and One Passenger.							
10	6.214	C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	6'13 2/5"
20	12.427	C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	12'26 3/5"
30	18.641	C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	18'42"
40	24.855	C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	24'49 4/5"
50	31.068	C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	31'01 3/5"
(c) Aviator and Two Passengers.							
5	3.107	T. O. M. Sopwith	Chicago, Ill.	Aug. 15, 1911	Wright	30 Wright	6'56 2/5"

2. *Distance in a given time.*

Distance Kilo.	Distance Miles	Holder	Place	Date	Machine	Motor	Time
(a) Aviator Alone.							
40	24.855	Jules Vedrines	Chicago, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	15'
80	49.7	Jules Vedrines	Chicago, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	30'
166.6	103.5	Jules Vedrines	Chicago, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	1 hr.
141.97	88.216	St. C. Johnstone	Mineola, N.Y.	July 27, 1911	Moisant	50 Gnome	2 hrs.
214.57	133.327	St. C. Johnstone	Mineola, N.Y.	July 27, 1911	Moisant	50 Gnome	3 hrs.
283.628	176.238	St. C. Johnstone	Mineola, N.Y.	July 27, 1911	Moisant	50 Gnome	4 hrs.
(b) Aviator and One Passenger.							
24.14	15	C. Grahame-White	Squantum, Mass.	Sept. 4, 1911	Nieuport	70 Gnome	15'
36.24	30	C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	30'

3. *Greatest Speed Obtained, whatever the length of the flight.*

Holder	Place	Date	Machine	Motor	Speed per Hour Kilo.	Speed per Hour Miles
(a) Aviator Alone.						
Jules Vedrines	Chicago, Ill.	Sept. 9, 1912	Deperdussin	140 Gnome	174.1	108.18
(b) Aviator and One Passenger.						
C. Grahame-White	Squantum, Mass.	Sept. 4, 1911	Nieuport	70 Gnome	101.762	63.232
(c) Aviator and Two Passengers.						
T. O. M. Sopwith	Chicago, Ill.	Aug. 15, 1911	Wright	30 Wright	56.263	34.96

AMERICAN AVIATION RECORDS—Continued.

B. *GREATEST DISTANCE.*

Aviator Alone.

Holder	Place	Date	Machine	Motor	Distance Covered Kilo	Distance Covered Miles
St. C. Johnstone	Mineola, N.Y.	July 27, 1911	Moisant	50 Gnome	283.628	176.238

C. *DURATION.*

Holder	Place	Date	Machine	Motor	Time
(a) Aviator Alone.					
Lieut. J. H. Towers, U.S.N.	Annapolis, Md.	Oct. 6, 1912	Curtiss hydro	75 Curtiss	6 hrs.10'35"
(b) Aviator and One Passenger.					
W. E. Johnson	Bath, N.Y	Oct. 31, 1912	Thomas biplane	65 Kirkham	3 hrs.51'15"
(c) Aviator and Two Passengers					
Lieut. T. deW. Milling, U.S.A.	Nassau Boulevard, N.Y.	Sept. 26, 1911	Burgess-Wright	30 Wright	1 hr.54'42 3/5"

D. *ALTITUDE.*

1. *Greatest Altitude.*

Holder	Place	Date	Machine	Motor	Altitude Attained Metres	Altitude Attained Feet
(a) Aviator Alone.						
Lincoln Beachey	Chicago. Ill.	Aug. 20, 1911	Curtiss	75 Curtiss	3,548.5	11,642
(b) Aviator and One Passenger.						
John Guy Gilpatric	Dominguez Field Los Angeles, Calif.	Nov. 28, 1912	Deperdussin	60 Anzani	1,422	4,665

2. *Climbing. (Upward Vertical Speed).*

Holder	Place	Date	Machine	Motor	Altitude Metres	Time
(a) Aviator Alone.						
R. Simon and T. O. M. Sopwith (tie)	Chicago, Ill.	Aug. 19, 1911	Bleriots Simon Sopwith	50 Gnome 70 Gnome	500* (1,640 ft.)	3'35"
(b) Aviator and One Passenger.						
C. Grahame-White	Nassau Boulevard, N.Y.	Sept. 30, 1911	Nieuport	70 Gnome	1,000* (2,280 ft.)	9 min.

**World's Records.*

E. *ALIGHTING.*

Holder	Place	Date	Machine	Motor	Distance from Mark
T. O. M. Sopwith	**Nassau Boulevard, N.Y.**	**July 22, 1911**	H. Wright biplane (Farman type)	60 h.p.E.N.V.	1 ft., 5½ in.

F. *WEIGHT-CARRYING.*

Holder	Place	Date	Machine	Motor	Weight
P. O. Parmelee	**Chicago, Ill.**	**August 19, 1911**	**Wright**	**30 Wright motor**	**458 lbs.**

AEROSTATS (SPHERICAL) BALLOONS.

Holder	Voyage	Date	Distance—Kilo.
Distance.			
A. R. Hawley	**St. Louis to Lake Tchotogama (Peribonka River), Quebec**	**Oct. 17-19, 1910**	**1887.6 (1172.9 miles)**
Duration.			
C. B. Harmon	**St. Louis to Edina, Mo.**	**Oct. 4, 1909**	**48 hrs. 26'**

AMERICAN AVIATION RECORDS—Continued.

AIRSHIPS (DIRIGIBLE) BALLOONS

Speed.

Name of Airship	Pilot	Course Followed	Date	Speed per Hour
U.S. Signal Corps No. 1	T. S. Baldwin	Fort Myer to Cherrydale and return	Aug. 14, 1908	31.559 kilom. (19.61 miles)

Duration.

U.S. Signal Corps No. 1	T. S. Baldwin	Fort Myer to Cherrydale and return	Aug. 15, 1908	2 hrs. 1'50"

KITES

Altitude.

Place	Date	Altitude Attained
Mt. Weather Observatory, Wis.	May 5, 1910	7,265 meters (23,835 feet)

THE AMERICAN MUSEUM OF SAFETY.

The American Museum of Safety, the twelfth institution of its kind in the world and the first in the United States, had its inception in two special expositions of safety in New York City—the first in 1907, lasting two weeks, and the second, in 1908, lasting two months. These beginnings led to the formal organization of the American Museum of Safety, which now holds a special charter of incorporation granted by the Assembly and Senate of the State of New York.

According to the Museum's special charter, the purpose of the institution is given as follows: "The objects of the corporation hereby created are to study and promote means and methods of safety and sanitation and the application thereof to any and all public and private occupations whatsoever, and of advancing knowledge of kindred subjects; and to that end to establish and maintain a museum, library and laboratories, and their branches, wherein all matters, methods and means for improving the general condition of the people as to their safety and health may be studied, tested and promoted, with a view to lessening the number of casualties and avoiding the causes of physical suffering and of premature death; and to disseminate the results of such study, researches, and tests by lectures, exhibitions and publications."

The American Museum of Safety is absolutely non-commercial. No orders are taken, no exhibits are sold, and no charge is made for space. Many of the devices are patented but may be practical, home-made appliances evolved in the experience and practice of the individuals or firms exhibiting them. No exhibits are accepted unless they have decided safety features.

With a view to stimulating the invention and introduction of safety devices in all the industries, and the promotion of hygiene and sanitation, three Gold Medals are annually awarded by the American Museum of Safety. The Travelers Insurance Company's Medal, the Louis Livingston Seaman Medal and The Scientific American Medal. The "Rathenau" German Medal has just been added.

The Scientific American Medal has been awarded four times. First, for a device for detecting fires at sea in holds, coal bunkers, etc. Second, for a safety scaffold that has practically eliminated hazard in this line of the building trades. Third, for a device for protecting workers on abrasive wheels. Fourth, to the Draeger Oxygen Apparatus Co., for the Pulmotor, an oxygen fed and driven device for artificial respiration.

THE CARNEGIE INSTITUTION.

This institution was founded by Mr. Andrew Carnegie for the promotion of original research in science, literature and art. He set aside $10,100,000 for the purpose. The interest is used to conduct, endow and assist investigation in any department of science, literature, or art, and to this end co-operate with governments, universities, colleges, technical schools, learned societies, and individuals. The headquarters of the institution are in Washington. Mr. R. S. Woodward is the President, and Mr. C. H. Dodge is the Secretary. Many grants have already been made, and the investigations have been important.

AVIATION WORLD RECORDS.

(Compiled by London Aeronautics.)

SPEED

	DISTANCE	TIME H. M. S.	PILOT	PLACE	DATE	AEROPLANE	MOTOR
Pilot Alone	5 km.	0 1 43 3/5	J. Védrines	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
	10 "	0 3 28	J. Védrines	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
	20 "	0 6 56	J. Védrines	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
	30 "	0 10 32 3/5	J. Védrines	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
	40 "	0 14 3 3/5	J. Védrines	United States	Sept. 9, 1912	Deperdussin m	160-Gnome
	50 "	0 17 35	J. Védrines	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
	100 "	0 35 16 1/5	J. Védrines	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
	150 "	0 52 52 3/5	J. Védrines	France	July 13, 1912	Deperdussin m.	160-Gnome
	200 "	1 10 55	J Védrines	France	July 13, 1912	Deperdussin m.	160-Gnome
	250 "	2 7 54	M. Tabuteau	France	Mar. 1, 1912	Morane-Saulnier m	50-Gnome
	300 "	2 49 0	M Gobioni	Italy	Mar. 28, 1912	Caproni m	60-Anzani
	350 "	3 26 16	E. Gilbert	France	Dec. 30, 1912	Clément-Bayard m.	50-Gnome
	400 "	3 55 27 3/5	E Gilbert	France	Dec. 30, 1912	Clément-Bayard m.	50-Gnome
	450 "	4 24 44 3/5	E. Gilbert	France	Dec. 30, 1912	Clément-Bayard m.	50-Gnome
	500 "	4 54 6 1/5	E. Gilbert	France	Dec. 30, 1912	Clément-Bayard m.	50-Gnome
	600 "	5 52 38	E. Gilbert	France	Dec. 30, 1912	Clément-Bayard m.	50-Gnome
	700 "	9 31 1	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	800 "	10 44 45 1/5	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	900 "	11 59 9 3/5	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	1000 "	13 1 12	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
One Passenger	5 km	0 2 58	H. Bier	Austria	Oct. 1, 1912	Etrich m.	120 Austrian-Daimler
	10 "	0 4 24 3/5	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	20 "	0 8 51	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	30 "	0 13 18 3/5	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	40 "	0 17 44 3/5	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	50 "	0 23 13	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	100 "	0 44 36 3/5	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	150 "	1 7 10	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	200 "	1 56 30	Slavorossoff	Italy	Jan. 26, 1912	Caproni m.	80-Gnome
	250 "	2 24 30	Slavorossoff	Italy	Jan. 26, 1912	Caproni m.	80-Gnome
	300 "	3 4 50	M. Guillaux	France	Feb. 11, 1912	Clément-Bayard m.	50-Gnome
	350 "	3 34 46	M. Guillaux	France	Feb. 11, 1912	Clément-Bayard m.	50-Gnome
	400 "	4 4 4	M. Guillaux	France	Feb. 11, 1912	Clément-Bayard m.	50-Gnome
Two Passengers	5 km.	0 2 52	C. Nieuport	Austria	June 30, 1912	Nieuport m.	70-Gnome
	10 "	0 5 45	C Nieuport	Austria	June 30, 1912	Nieuport m.	70-Gnome
	20 "	0 11 59 3/5	E. Nieuport	France	Mar. 9, 1911	Nieuport m.	50-Gnome
	30 "	0 17 52 3/5	E. Nieuport	France	Mar. 9, 1911	Nieuport m.	50-Gnome
	40 "	0 22 44 3/5	E. Nieuport	France	Mar. 9, 1911	Nieuport m.	50-Gnome
	50 "	0 29 37 3/5	E. Nieuport	France	Mar. 9, 1911	Nieuport m	50-Gnome
	100 "	0 59 8	E. Nieuport	France	Mar. 9, 1911	Nieuport m.	50-Gnome
Three Passengers	5 km.	0 3 48	P. Mandelli	Austria	Aug. 16, 1912	Autoplan m	—
	10 "	0 6 16 3/5	Busson	France	Mar. 10, 1911	Deperdussin m	—
	20 "	0 12 3	P. Mandelli	Austria	Aug. 16, 1912	Autoplan m.	—
	30 "	0 17 37	P. Mandelli	Austria	Aug. 16, 1912	Autoplan m.	—
	40 "	0 23 11	P Mandelli	Austria	Aug. 26, 1912	Autoplan m.	—
	50 "	0 29 47	P. Mandelli	Austria	Aug. 16, 1912	Autoplan m.	—
	100 "	0 56 33	P. Mandelli	Austria	Aug. 16, 1912	Autoplan m.	—
Four Passengers	5 km.	0 3 34	Busson	France	Mar. 10, 1911	Deperdussin m.	—
	10 "	0 7 8	Busson	France	Mar. 10, 1911	Deperdussin m.	—
	20 "	0 14 0 3/5	Busson	France	Mar. 10, 1911	Deperdussin m.	—
	30 "	0 21 53 1/5	F. Champel	France	April 15, 1913	Champel b.	100-Anzani
	40 "	0 29 13 1/5	F. Champel	France	April 15, 1913	Champel b.	100-Anzani
	50 "	0 36 31	F. Champel	France	April 15, 1913	Champel b.	100-Anzani
	100 "	1 13 1 1/5	F. Champel	France	April 15, 1913	Champel b.	100-Anzani
	150 "	1 49 11 3/5	F. Champel	France	April 15, 1913	Champel b.	100-Anzani
	200 "	2 25 2 1/5	F Champel	France	April 15, 1913	Champel b.	100-Anzani
	250 "	3 1 17	F Champel	France	April 15, 1913	Champel b.	100-Anzani

GREATEST SPEED (OVER 5 KM CIRCUIT)

	PILOT	SPEED m.p.h.	PLACE	DATE	AEROPLANE	MOTOR
Pilot Alone	J. Védrines	108·12	United States	Sept. 9, 1912	Deperdussin m.	160-Gnome
One Passenger ...	G. Legagneux	84·42	France	July 20, 1912	Zens m.	80-Gnome
Two Passengers ...	E. Nieuport	63·87	France	Mar 9, 1911	Nieuport m.	50-Gnome
Three Passengers ...	P. Mandelli	65·84	Austria	Aug 16, 1912	Autoplan m.	—
Four Passengers ...	Busson	54·18	France	Mar 10, 1911	—	—

DISTANCE

	PILOT	DISTANCE miles	PLACE	DATE	AEROPLANE	MOTOR
Pilot Alone	M. Fourny	627·77	France	Sept. 11, 1912	M. Farman b.	70-Renault
One Passenger ...	M. Guillaux	255	France	Feb. 11, 1913	Clément-Bayard m.	50-Gnome
Two Passengers ...	H. Bier	69·55	Austria	Oct. 1, 1911	Etrich m.	120-Austrian-Daimler
Three Passengers ...	P Mandelli	68·31	Austria	Aug. 16, 1912	Autoplan m.	—
Four Passengers ..	F Champel	155	France	April 15, 1913	Champel b.	100-Anzani

Courtesy of "Flying."

AVIATION WORLD RECORDS—Continued.

TIME

	TIME	DISTANCE	PILOT	PLACE	DATE	AEROPLANE	MOTOR
		miles					
Pilot Alone ..	¼ hr	28·35	J. Védrines	France	July 13, 1912	Deperdussin m.	160-Gnome
	½ "	52·57	J. Védrines	France	July 13, 1912	Deperdussin m.	160-Gnome
	1 "	104·48	J. Védrines	France	July 13, 1912	Deperdussin m.	160-Gnome
	2 "	145·58	M. Tabuteau	France	Mar. 1, 1912	Morane-Saulnier m.	50-Gnome
	3 "	192·68	M. Tabuteau	France	Mar 1, 1912	Morane-Saulnier m	50-Gnome
	4 "	255·17	E. Gilbert	France	Dec. 30, 1912	Morane-Saulnier m.	50-Le Rhône
	5 "	316·71	E. Gilbert	France	Dec 30, 1912	Morane-Saulnier m.	50-Le Rhône
	6 "	304·29	P M Bournique	France	Dec. 31, 1910	REP m.	60-REP
	7 "	324·74	M. Tabuteau	France	Dec. 30, 1910	M. Farman b.	70-Renault
	8 "	363·41	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	9 "	410·60	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	10 "	462·52	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	11 "	509·72	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	12 "	561·63	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
	13 "	618·83	M. Fourny	France	Sept. 11, 1912	M. Farman b.	70-Renault
One Passenger ...	¼ hr	19·26	Legagneux	France	July 5, 1912	Zens m.	80-Gnome
	½ "	41·38	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	1 "	72·88	Legagneux	France	July 20, 1912	Zens m.	80-Gnome
	2 "	119	M. Guillaux	France	Feb. 11, 1913	Clément-Bayard m.	50-Gnome
	3 "	181	M. Guillaux	France	Feb. 11, 1913	Clément-Bayard m.	50-Gnome
	4 "	243	M. Guillaux	France	Feb. 11, 1913	Clément-Bayard m.	50-Gnome
Three Passengers ...	1 hr.	65·84	P Mandelli	Austria	Aug. 16, 1912	Autoplan m.	—
Four Passengers ...	¼ hr	12·5	F Champel	France	April 15, 1913	Champel b.	100-Anzani
	½ "	25	F Champel	France	April 15, 1913	Champel b.	100-Anzani
	1 "	51	F Champel	France	April 15, 1913	Champel b.	100-Anzani
	2 "	102·5	F. Champel	France	April 15, 1913	Champel b.	100-Anzani
	3 "	153·5	F Champel	France	April 15, 1913	Champel b	100-Anzani

DURATION

	PILOT	TIME (H. M. S.)	PLACE	DATE	AEROPLANE	MOTOR
Pilot Alone	M Fourny	13, 17 57½	France	Sept. 11, 1912	M Farman b	70-Renault
One Passenger ...	J. Savelack	4 34 0	Germany	Nov 8, 1911	—	—
Two Passengers ..	H Oelerich	2 41 0	Germany	July 5, 1912	—	—
Three Passengers ...	Grulich	1 35 0	Germany	Jan. 25, 1912	—	—
Four Passengers ...	F Champel	3 1 17	France	April 15, 1913	Champel b.	100-Anzani
Five Passengers ...	H. Faller	1 10 17	Germany	Feb 9, 1913	Aviatik b.	—
Six Passengers ...	H. Faller	0 20 20	Germany	Jan. 4, 1913	Aviatik b.	—
Eight Passengers ...	Frantz	0 11 28½	France	Mar. 8, 1913	Savary b.	110-Canton-Unné

HEIGHT

	HEIGHT	PILOT	PLACE	DATE	AEROPLANE	MOTOR
Pilot Alone	19,600 ft	J. Perreyon	France	Mar 11, 1913	Blériot m.	160-Gnome
One Passenger ...	16,270 "	J. Perreyon	France	June 3, 1913	Blériot m.	80-Gnome
Two Passengers ...	11,740 "	von Blaschke	Austria	June 29, 1912	Lohner b.	120-Austrian-Daimler
Three Passengers ...	5,510 "	Marty	France	April 15, 1913	Caudron b.	100-Anzani
Four Passengers ...	4,590 "	Marty	France	April 15, 1913	Caudron b.	100-Anzani
Five Passengers ...	3,600 "	P. Gougenheim	France	Feb. 10, 1913	H. Farman b	80-Gnome
Six Passengers ...	2,790 "	Frangeois	France	May 8, 1913	H. Farman b	80-Gnome

BALLOONS

PILOT	JOURNEY	DATE	DISTANCE
DISTANCE			
E. Rumpelmayer	Lamotte-Voltchy-Iar	March 19-21, 1913	1503 miles
DURATION			
Col. Schaeck	Berlin-Borgnet	1908	73 hours
ALTITUDE			
Berson and Süring ...	Berlin	June 30, 1901	35,420 ft.

AVIATION FATALITIES.

Keeping pace with the marvelous development in the field of aeronautics has been the growing increase in the number of fatalities due to accidents in the air. Hardly a day passes without its victim, and while at first people were horrified, to-day they take it as a matter of course, giving it merely a passing notice.

Since 1908 there have been 371 aviators killed in the attempt to conquer the air. During the year 1908 one aviator was killed; 4 were killed in 1909; 36 in 1910; 73 in 1911; 127 in 1912 and 130 in 1913 (up to Sept. 24).

Germany, which of late has been more active in aeronautics than any other nation, has lost 121 airmen; France is second with 99 and the United States third with 66. Then in order follow England with 25, Russia 18, Austria 9, Japan 8, Greece 6, Belgium 6, Switzerland 3 and all others, including Italy, China, Spain and Peru, have lost 10 airmen. The heavy toll in Germany is probably due to the dirigible balloon. The majority of the aviators killed in the various countries have been army aviators, due to the attempts to increase the possibility of the aeroplane as a naval scout.

LATEST WORLD'S FLYING RECORDS.

SPEED.

Time on a given distance.

(Aviator alone)

On June 17, 1913. M. Prévost broke all speed records for distances of 10 to 100 kilometers, on the course at Etampes, France. His time for the various distances was as follows: 10 km. (6.214 miles), 3m. $20\frac{1}{5}$ s.; 20 km. (12.427 miles), 6m. $50\frac{1}{2}$ s.; 30 km. (18.641 miles), 10 m. 2 s.; 40 km. (24.855 miles), 13 m. 23 s.; 50 km. (31.068 miles), 16 m. $43\frac{3}{5}$ s.; 100 km. (62.137 miles), 33m. $30\frac{2}{5}$ s.

The record for 250 kilometers was broken by J. Védrines on Jan. 9, 1913, his time for the distance being 2 hrs. 1 m. $53\frac{2}{5}$ s. The record for 200 kilometers was broken on September 29, 1913, at the Bethany aerodrome, by Maurice Prévost, whose time for the distance was 59 m. $45\frac{3}{5}$ s.; a terrific speed of 124.80 miles per hour.

GREATEST SPEED.

(Over 5 km. circuit)

(Aviator alone)

M. Prévost broke all speed records, over a 5 kilometer course, at Etampes, France, June 17, 1913, when he attained a speed of 111.66 miles per hour.

TIME.

Distance in a given time.

(Aviator alone)

On June 17, 1913, M. Prévost covered a distance of 53.59 miles in one-half hour.
On July 13, 1913, J. Védrines covered a distance of 153.34 miles in 2 hours.

DURATION.

Practically all the records for duration have been broken by H. Faller of Germany. On Feb. 13, 1913 he carried 2 passengers for 3 hrs. 16 m. On Jan. 30, 1913 he carried 3 passengers for 2 hrs. 3 m. On Jan. 5, 1913 he carried 6 passengers for 1 hr. and 7 passengers for 6 m. 49 s.

CROSS COUNTRY.

1. SPEED.

On September 15, 1913, Maurice Guillaux established a new cross-country record, covering a distance of 118 miles, with a passenger, from Savigny-sur-Brage to Paris, in 50 minutes. This was at the rate of nearly 142 miles per hour.

2. TIME.

Distance in a given time.

(Aviator alone)

The single-day record for cross-country flight is held by Maurice Guillaux, having covered $859\frac{3}{4}$ miles.

AMERICAN AVIATION RECORDS.

CROSS COUNTRY.

1. DISTANCE.

(a) Aviator alone.

220 miles, Lt. T. deWitt Milling, U.S.A.—Texas City, Texas to San Antonio, Texas—March 28th, 1913—Burgess-Wright Tractor biplane—70 h.p. Renault motor.

(b) Aviator and one passenger.

(Same as above).

2. DURATION.

(a) Aviator alone.

Lt. T. deWitt Milling, U.S.A.—Texas City, Texas to San Antonio, Texas, March 28, 1913—Burgess-Wright Tractor biplane—70 h.p. Renault motor—4 hours, 22 minutes.

(b) Aviator and one passenger.

(Same as for aviator alone).

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The American Association for the Advancement of Science, organized in 1848, is a learned society existing as a continuation of the American Association of Geologists and Naturalists, organized in 1840. It was chartered in its present form in 1874. At present it has a membership of about 8,000. Any person may become a member of the association upon recommendation in writing of two members or fellows, after which he is elected to membership by the Council, or by the special committee of the Council resident in Washington. The admission fee for members is $5 and the annual dues $3.

Fellows are elected by the Council from such of the members as are professionally engaged in science. On the election of any member as a fellow, a fee of $2 is paid in addition to the annual dues of $3.

Any member or fellow who pays the sum of $50 to the association, at any one time, becomes a life member and as such is exempt from all further assessments. Any person paying the sum of $1,000 is classed as a patron.

The association is made up of 11 sections as follows:

Mathematics and Astronomy; Physics; Chemistry; Mechanical Science and Engineering; Geology and Geography; Zoology; Botany; Anthropology and Psychology; Social and Economic Science; Physiology and Experimental Medicine; Education.

NATIONAL ACADEMY OF SCIENCES.

The National Academy of Sciences was incorporated under the Act of Congress May 3, 1863, with the object that it "shall, whenever called upon by any department of the Government, investigate, examine, experiment and report upon any subject of science or art; the actual expense *** to be paid from appropriation which may be made for the purpose." The Association can not, under any circumstances receive compensation from the government for its services. The annual meeting is held in Washington on the third Tuesday in April; annual reports are made each year at the Autumn meeting which is held at such places in the United States as may be designated by the Council. The membership of the Association is limited to 150, not more than 10 to be elected in one year; the number of foreign associates is limited to 50. There are at present 120 members and 44 foreign associates.

THE SMITHSONIAN INSTITUTION.

The Smithsonian Institution was created in 1846 by an Act of Congress in accordance with the provisions of the will of James Smithson, an English chemist and mineralogist, who bequeathed his fortune to the United States for the purpose of establishing at Washington, an institution for "the increase and diffusion of knowledge among men." From the income of the fund the building, known as the Smithsonian Building, was erected in Washington, D. C. The institution is legally an establishment having as its members the President of the United States, the Vice-President, the Chief Justice and the President's Cabinet. It is governed by a Board of Regents consisting of the Vice-President, the Chief Justice, three members of the United States Senate, three members of the House of Representatives and six citizens appointed by joint resolution of Congress.

For increase of knowledge, the institution aids investigation by making grants for research and exploration, supplying books, apparatus, etc. It occasionally provides lectures which are published; initiates scientific projects; publishes scientific papers. For the diffusion of knowledge the institution issues three regular series of publications: "Annual Report," "Smithsonian Contributions to Knowledge," and "Smithsonian Miscellaneous Collections." The institution in co-operation with the Library of Congress maintains a scientific library which contains about 260,000 volumes. The original endowment of $541,000 has been increased by gifts and accumulated interest to $987,000, yielding an annual income of $58,375.

THE UNITED STATES CENSUS BUREAU.

The work of the Bureau of the Census, which is under the control of the Department of Commerce and Labor, is divided into two main branches, namely, the taking of the decennial censuses of the United States, and of collecting such special statistics as are required by Congress. The thirteenth decennial census was taken in 1910 and in accordance with the Act of Congress approved July 2, 1902, covered population, agriculture, manufactures and mines and quarries.

The special statistical inquiries, which are mostly made in the intervals between the decennial censuses, include statistics of births and deaths in registered areas; statistics regarding the insane, feeble-minded, deaf and dumb, and blind; crime, pauperism and benevolence; social and financial statistics of cities; wealth, debt and taxation; religious bodies; electric light and power, telephones and telegraphs, and street railways; transportation by water; cotton production and distribution; and production of forest products. The statistics relating to deaths in cities and to the production of cotton are secured annually; the other statistics mentioned are secured at intervals of from five to ten years, but not at the same time as the regular decennial censuses.

THE PRESIDENTIAL SUCCESSION.

In case of the removal, death, resignation or inability of both the President and Vice-President, then the Secretary of State shall act as President until the disability of the President or Vice-President is removed or a President is elected. The remainder of the order of succession is as follows: Secretary of the Treasury, Secretary of War, Attorney-General, Postmaster-General, Secretary of the Navy, and Secretary of the Interior. The acting President must, upon taking office, convene Congress, if not at the time in session, in extraordinary session, giving twenty days' notice.

COMPARATIVE TABLE OF PROGRESSION OF AMERICAN AND EUROPEAN DURATION RECORDS.

PROGRESSION OF AMERICAN DURATION RECORD.

Date	*Time*	*Aviator*	*Machine*	*Place*
Dec. 17, 1903	59″	W. Wright	Wright bi	Kitty Hawk, N. C.
Aug. 1904	About 1′	W. Wright	Wright bi	near Dayton, Ohio
Sept. 15, 1904	1st turn	O. Wright	Wright bi	near Dayton, Ohio
Sept. 20, 1904	1st circle	O. Wright	Wright bi	near Dayton, Ohio
Nov. 9, 1904	5′ 04″	W. Wright	Wright bi	near Dayton, Ohio
Sept. 1905	5′ to 15′	W. Wright	Wright bi	near Dayton, Ohio
Sept. 26, 1905	18′ 09″	W. Wright	Wright bi	near Dayton, Ohio
Sept. 29, 1905	19′ 55″	O. Wright	Wright bi	near Dayton, Ohio
Oct. 3, 1905	25′ 05″	O. Wright	Wright bi	near Dayton, Ohio
Oct. 4, 1905	33′ 17″	O. Wright	Wright bi	near Dayton, Ohio
Oct. 5, 1905	38′ 03″	W. Wright	Wright bi	near Dayton, Ohio
Sept. 9, 1908	57′ 31″	O. Wright	Wright bi	Fort Myer, Va.
Sept. 9, 1908	1 hr. 02′ 15″	O. Wright	Wright bi	Fort Myer, Va.
Sept. 10, 1908	1 hr. 05′ 52″	O. Wright	Wright bi	Fort Myer, Va.
Sept. 11, 1908	1 hr. 10′ 24″	O. Wright	Wright bi	Fort Myer, Va.
Sept. 12, 1908	1 hr. 14′ 20″	O. Wright	Wright bi	Fort Myer, Va.
July 20, 1909	1 hr. 20′ 45″	O. Wright	Wright bi	Fort Myer, Va.
Jan. 17, 1910	1 hr. 58′ 32″	L. Paulhan	H. Farman bi	Los Angeles, Cal.
July 2, 1910	2 hrs. 03′ 30″	C. B. Harmon	H. Farman bi	Mineola, N. Y.
Sept. 12, 1910	3 hrs. 05′ 40″	R. Johnstone	Wright bi	Boston, Mass.
Oct. 11, 1910	3 hrs. 11′ 55″	A. L. Welsh	Wright bi	St. Louis, Mo.
Dec. 30, 1910	3 hrs. 16′ 50″	A. Hoxsey	Wright bi	Los Angeles, Cal.
Jan. 22, 1911	3 hrs. 38′ 49″	P. O. Parmelee	Wright bi	San Francisco, Cal.
July 27, 1911	4 hrs. 1′ 52″	St. Croix Johnstone	Blériot mono	Mineola, N. Y.
Oct. 19, 1911	4 hrs. 16′ 35″	H. W. Gill	Wright bi	Kinloch, Mo.

FAMOUS WATERFALLS OF THE WORLD.

Name and Location.	Height in feet.
Grand, Labrador	2,000
Sutherland, New Zealand	1,904
Yosemite (upper), Cal	1,436
Gavarnie, France	1,385
Takkakaw, Brit. Col	1,200
Staubbach, Switzerland	1,000
Vettis, Norway	950
Multnomah, Oregon	850
Rjukan, Norway	780
Yosemite (middle), Cal	626
Voringfos, Norway	600
Skajaeggedalsfos, Norway	530
Stirling, New Zealand	500
Yosemite (lower), Cal	400
Victoria, Africa	400
Yellowstone (lower), Mont	310
Montmorenci, Quebec	265
Shoshone, Idaho	210
Ygnassu, Brazil	210
Twin, Idaho	180
Niagara, New York-Ontario	164
Yellowstone (upper), Montana	110
Murchison, Africa	120
Schaffhausen, Switzerland	100
Missouri, Montana	90
Minnehaha, Minnesota	50

PROGRESSION OF EUROPEAN DURATION RECORD.

Date	*Time*	*Aviator*	*Machine*	*Place*
Nov. 12, 1906	21 1-5″	A. Santos-Dumont	Santos-Dumont bi.	Bagatelle, near Paris
Oct. 26, 1907	27″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Oct. 26, 1907	31 3-5″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Oct. 26, 1907	52 3-5″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Nov. 9, 1907	1st turn 1′ 14″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Jan. 13, 1908	1′ 28″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Jan. 13, 1908	1′ 33″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Mar. 21, 1908	1st circle 3′ 39″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Apr. 11, 1908	6′ 30″	L. Delagrange	Voisin bi	Issy-les-Moulineaux, France
May 27, 1908	9′ 30″	L. Delagrange	Voisin bi	Rome, Italy
May 30, 1908	15′ 26 4-5″	L. Delagrange	Voisin bi	Rome, Italy
June 22, 1908	16′ 30″	L. Delagrange	Voisin bi	Milan, Italy
July 6, 1908	20′ 19 3-5″	H. Farman	Voisin bi	Issy-les-Moulineaux, France
Sept. 6, 1908	29′ 53 3-5″	L. Delagrange	Voisin bi	Issy-les-Moulineaux, France
Sept. 16, 1908	39′ 18 3-5″	W. Wright	Wright bi	near Le Mans, France
Sept. 21, 1908	1 hr. 31′ 25 4-5″	W. Wright	Wright bi	near Le Mans, France
Dec. 18, 1908	1 hr. 54′ 53 2-5″	W. Wright	Wright bi	near Le Mans, France
Dec. 31, 1908	2 hrs. 20′ 23 1-5″	W. Wright	Wright bi	near Le Mans, France
Aug. 7, 1909	2 hrs. 27′ 15″	R. Sommer	Sommer bi	Mourmelon, France
Aug. 25, 1909	2 hrs. 43′ 24 4-5″	L. Paulhan	H. Farman bi	near Rheims, France
Aug. 27, 1909	3 hrs. 15′	H. Farman	H. Farman bi	near Rheims, France
Nov. 3, 1909	4 hrs. 17′ 53 2-5″	H. Farman	H. Farman bi	Mourmelon, France
July 9, 1910	4 hrs. 37′ 00 2-5″	R. Labouchere	Blériot mono	near Rheims, France
July 10, 1910	5 hrs. 03′ 05 1-5″	J. Olieslaegers	Blériot mono	near Rheims, France
Oct. 28, 1910	6 hrs. 01′ 35″	M. Tabuteau	M. Farman bi	Buc, France
Dec. 18, 1910	8 hrs. 12′ 47 2-5″	H. Farman	H. Farman bi	Etampes, France
Sept. 1, 1911	11 hrs. 1′ 29 1-5″	G. Fourny	M. Farman bi	Buc, France

All records are from the Bulletin of the Aero Club of America, Reproduced by permission.

SCIENTIFIC AMERICAN TROPHY. (See page 447.)

The Scientific American Trophy, shown on page 447, was donated with the object of fostering the art of aerial navigation. The deed of gift by which it was transferred to keeping of the Aero Club of America called for annual competition by heavier-than-air machines, with the understanding that the conditions governing the contest were to be changed from time to time, so as to keep pace with the progress made in the art of flying. On July 4, 1908, Mr. Glenn H. Curtiss won the trophy for that year by flying for a distance of slightly more than a mile in his new bi-plane, the "June Bug." In 1909, Curtiss again won the cup by flying a distance of about 25 miles in a closed circuit. In 1910, Curtiss won the cup for the third and last time in connection with his great flight from Albany to New York, when he covered a straightaway distance from Albany to Poughkeepsie of 74¼ miles without a stop. Mr. Curtiss by winning three times secured permanent possession of the trophy.

PART II.

CHAPTER I.

CHEMISTRY.

EDITED BY WILLIAM W. SHARE, Ph.D.

INTERNATIONAL ATOMIC WEIGHTS FOR 1912.

Element.	Symbol.	O=16.	H=1.	Element.	Symbol.	O=16.	H=1.
Aluminium	Al	27.1	26.88	Molybdenum	Mo	96.0	95.2
Antimony	Sb	120.2	119.25	Neodymium	Nd	144.3	143.2
Argon	A	39.88	39.56	Neon	Ne	20.2	20.
Arsenic	As	74.96	74.37	Nickel	Ni	58.68	58.21
Barium	Ba	137.37	136.28	Niton	Nt	222.4	220.6
Bismuth	Bi	208.	206.35	Nitrogen	N	14.01	13.90
Boron	B	11.	10.91	Osmium	Os	190.9	189.4
Bromine	Br	79.92	79.29	Oxygen	O	16.	15.88
Cadmium	Cd	112.40	111.51	Palladium	Pd	106.7	105.8
Caesium	Cs	132.81	131.8	Phosphorus	P	31.04	30.79
Calcium	Ca	40.07	39.75	Platinum	Pt	195.2	194.64
Carbon	C	12.	11.91	Potassium	K	39.10	38.79
Cerium	Ce	140.25	139.1	Praseodymium	Pr	140.6	139.5
Chlorine	Cl	35.46	35.18	Radium	Ra	226.4	224.6
Chromium	Cr	52.	51.59	Rhodium	Rh	102.9	102.1
Cobalt	Co	58.97	58.5	Rubidium	Rb	85.45	84.8
Columbium	Cb	93.5	92.76	Ruthenium	Ru	101.7	100.9
Copper	Cu	63.57	63.06	Samarium	Sa	150.4	149.2
Dysprosium	Dy	162.5	161.2	Scandium	Sc	44.1	43.8
Erbium	Er	167.7	166.4	Selenium	Se	79.2	78.6
Europium	Eu	152.	151.1	Silicon	Si	28.3	28.08
Fluorine	F	19.	18.75	Silver	Ag	107.88	107.02
Gadolinium	Gd	157.3	156.1	Sodium	Na	23.	22.82
Gallium	Ga	69.9	69.3	Strontium	Sr	87.63	86.93
Germanium	Ge	72.5	71.9	Sulphur	S	32.07	31.82
Glucinum	Gl	9.1	9.	Tantalum	Ta	181.5	180.1
Gold	Au	197.2	195.6	Tellurium	Te	127.5	126.5
Helium	He	3.99	3.96	Terbium	Tb	159.2	157.9
Hydrogen	H	1.008	1.	Thallium	Tl	204.	202.4
Indium	In	114.8	113.9	Thorium	Th	232.4	230.6
Iodine	I	126.92	125.91	Thulium	Tm	168.5	167.2
Iridium	Ir	193.1	191.56	Tin	Sn	119.	118.06
Iron	Fe	55.84	55.4	Titanium	Ti	48.1	47.7
Krypton	Kr	82.92	82.2	Tungsten	W	184.	182.5
Lanthanum	La	139.	137.9	Uranium	U	238.5	236.6
Lead	Pb	207.1	205.46	Vanadium	V	51.	50.6
Lithium	Li	6.94	6.88	Xenon	Xe	130.2	129.2
Lutecium	Lu	174.	172.6	Ytterbium (Neo)	Yb	172.	170.6
Magnesium	Mg	24.32	24.13	Yttrium	Yt	89.	88.3
Manganese	Mn	54.93	54.49	Zinc	Zn	65.37	64.8
Mercury	Hg	200.6	199.01	Zirconium	Zr	90.6	89.95

THE ELEMENTS IN THE ORDER OF THEIR DISCOVERY.

Element.	Discoverer.	Date.	Element.	Discoverer.	Date.
Carbon	Prehistoric		Antimony	Valentine	1450
Copper	"		Bismuth	"	1450
Gold	"		Zinc	Paracelsus	1520
Silver	"		Phosphorus	Brandt	1669
Iron	"		Arsenic	Schroeder	1694
Sulphur	"		Cobalt	Brandt	1733
Mercury	"		Platinum	Wood	1741
Tin	"		Nickel	Cronstedt	1751
Lead	"		Hydrogen	Cavendish	1766

THE ELEMENTS IN THE ORDER OF THEIR DISCOVERY—Continued.

Element.	Discoverer.	Date.	Element.	Discoverer.	Date.
Fluorine	Scheele	1771	Thorium	Berzelius	1828
Nitrogen	Rutherford	1772	Yttrium	Woehler	1828
Chlorine	Scheele	1774	Magnesium	Bussy	1829
Manganese	Gahn	1774	Vanadium	Sefstroem	1830
Oxygen	Priestley	1774	Lanthanum	Mosander	1839
Tungsten	d'Elhujur	1781	Erbium	"	1843
Molybdenum	Hjelm	1782	Terbium	"	1843
Tellurium	Reichenstein	1782	Ruthenium	Claus	1845
Uranium	Klaproth	1789	Caesium	Bunsen	1860
Titanium	Gregor	1789	Rubidium	"	1860
Chromium	Vauquelin	1797	Thallium	Crookes	1862
Columbium	Hatchett	1801	Indium	Reich & Richter	1863
Tantalum	Ekeberg	1802	Gallium	Boisbaudran	1875
Cerium	Berzelius	1803	Ytterbium	Marignac	1878
Iridium	Tennant	1803	Samarium	Boisbaudran	1879
Osmium	"	1803	Scandium	Nilson	1879
Palladium	Wollaston	1804	Thulium	Cleve	1879
Rhodium	"	1804	Neodymium	Welsbach	1885
Sodium	Davy	1807	Praseodymium	"	1885
Potassium	"	1807	Gadolinium	Marignac	1886
Calcium	"	1808	Germanium	Winkler	1886
Barium	"	1808	Argon	Ramsay & Rayleigh	1894
Strontium	"	1808	Helium	Ramsay	1895
Boron	"	1808	Krypton	Ramsay & Travers	1898
Iodine	Courtois	1811	Neon	"	1898
Cadmium	Stromeyer	1817	Xenon	"	1898
Lithium	Arfvedson	1817	Radium	Curie	1898
Selenium	Berzelius	1817	Europium	Demarçay	1901
Silicon	"	1823	Dysprosium	Urbain	1906
Zirconium	"	1824	Lutecium	"	1907
Bromine	Balard	1826	Neoytterbium	"	1907
Aluminium	Woehler	1828	Niton	Ramsay & Gray	1910
Glucinum	"	1828			

MELTING POINTS OF SOME CHEMICAL ELEMENTS.

Substance.	Degrees Cent.	Degrees Fahr.	Substance.	Degrees Cent.	Degrees Fahr.
Aluminium	657	1215	Magnesium	632.6	1171
Antimony	630	1168	Manganese	1207	2205
Bismuth	269	516	Mercury	-38.85	-37.93
Cadmium	321.7	611	Nickel	1435	2615
Calcium	800	1472	Phosphorus	44.2	112
Chromium	1515	2759	Platinum	1753	3187
Cobalt	1464	2667	Potassium	63.6	146.5
Copper	1065	1949	Selenium	217	423
Gold	1060	1940	Silver	961.5	1763
Iridium	1950	3542	Sodium	97.6	208
Iron, pure	1505	2741	Sulphur	114.5	238
gray pig	1275	2327	Tantalum	2300	4172
white pig	1075	1967	Tin	232	550
Steel,	1360	2480	Titanium	3000	5432
cast	1375	2507	Tungsten	2800	5072
Lead	327	621	Vanadium	1680	3056
Lithium	180	356	Zinc	419	786

BOILING POINTS OF SOME CHEMICAL ELEMENTS.

Substance.	Degrees Cent.	Degrees Fahr.	Substance.	Degrees Cent.	Degrees Fahr.
Bromine	58.7	137.6	Oxygen	-182.5	-296.5
Cadmium	778	1400	Ozone	-119	-182.2
Chlorine	-33.6	-28.5	Phosphorus	290	554
Fluorine	-187	-304.6	Potassium	757.5	1396
Hydrogen	-252.5	-422.5	Selenium	690	1274
Iodine	185.5	366	Sodium	877.5	1612
Mercury	357.33	675.2	Sulphur	444.6	800
Nitrogen	-195.5	-320	Zinc	918	1684

THE MOST PLENTIFUL ELEMENTS AND THEIR PERCENTAGE DISTRIBUTION IN KNOWN MATTER.

Oxygen	47.98	Titanium	.30
Silicon	25.30	Carbon	.21
Aluminium	7.26	Chlorine	.15
Iron	5.08	Phosphorus	.09
Calcium	3.51	Manganese	.07
Magnesium	2.50	Sulphur	.04
Sodium	2.28	Barium	.03
Potassium	2.23	Nitrogen	.02
Hydrogen	.94	Chromium	.01

ELEMENTARY COMPOSITION OF THE HUMAN BODY.

	Per cent.	Pounds.
Oxygen	62.43	93.645
Carbon	21.15	51.725
Hydrogen	9.865	14.798
Nitrogen	3.1	4.65
Calcium	1.9	2.85
Phosphorus	.946	1.419
Potassium	.23	.345
Sulphur	.162	.243
Chlorine	.081	.121
Sodium	.081	.122
Magnesium	.027	.040
Iron	.014	.021
Fluorine	.014	.021
	100.	150.

HEAT OF COMBUSTION

SUBSTANCE.	CALORIES.	B. T. U.
Alcohol, ethyl	7,184	12,931
" methyl	5,330	9,594
" amyl	8,958	16,124
Benzene	10,030	18,054
Carbon, amorphous	8,080	14,544
Coal, bituminous	7,800	14,040
	9,000	16,200
" anthracite	7,800	14,040
" lignite	6,900	12,420
Coke	7,000	12,600
Gas, coal	4,440	7,990
	7,370	12,266
Acetylene	11,927	21,469
Ethylene	11,858	21,344
Methane	13,063	23,513
Hydrogen	34,462	62,032
Carbon monoxide	5,640	10,152
Oil, lard	9,300	16,740
" olive	9,473	17,051
Wood, hard	4,750	8,550
" soft resinous	5,050	9,090

A Calorie is the amount of heat required to raise 1 gramme of water 1 degree Centigrade.

A British Thermal Unit (B. T. U.) is the amount of heat required to raise 1 pound of water 1 degree Fahrenheit.

CHEMICAL SUBSTANCES AND THEIR COMMON NAMES.

COMMON NAME.	CHEMICAL NAME.
Alcohol	Ethyl alcohol
Alum	Potassium aluminium sulphate
Aqua fortis	Nitric acid
Aqua regia	Nitro-hydrochloric acid
Banana ether	Amyl acetate
Black lead	Graphite carbon
Borax	Sodium tetraborate
Brimstone	Sulphur
Calomel	Mercurous chloride
Carbolic acid	Phenol
Caustic potash	Potassium hydroxide
" soda	Sodium hydroxide
Chalk	Calcium carbonate
Choke damp	Carbon dioxide
Chrome yellow	Lead chromate
" green	Chromium oxide
Clay	Aluminum silicate
Copperas	Ferrous sulphate
Corrosive sublimate	Mercuric chloride
Cream of tartar	Potassium hydrogen tartrate
Epsom salts	Magnesium sulphate
Fire damp	Methane
Fusel oil	Amyl alcohol
Glauber's salt	Sodium sulphate
Grape sugar	Glucose
Goulard water	Basic lead acetate
Iron pyrites	Iron disulphide
Laughing gas	Nitrous oxide
Lime, quick	Calcium oxide
" slaked	" hydroxide
Litharge	Lead oxide
Lunar caustic	Silver nitrate
Marsh gas	Methane
Mosaic gold	Stannic sulphide
Muriatic acid	Hydrochloric acid
Orpiment	Arsenic trisulphide
Paris green	Copper arsenite
Plaster of Paris	Calcium sulphate
Prussian blue	Ferric ferrocyanide
Realgar	Arsenic disulphide
Red lead	Lead oxide
Rochelle salt	Sodium potassium tartrate
Sal ammoniac	Ammonium chloride
Salt, common	Sodium chloride
Salt of tartar	Potassium carbonate
Saltpetre	" nitrate
Salts of lemon	Oxalic acid
Soda, washing	Sodium carbonate
" baking	" hydrogen carbonate
" ash	Sodium carbonate
Spirits of hartshorn	Ammonium hydroxide
Spirits of salt	Hydrochloric acid
Tartar emetic	Potassium antimonyl tartrate
Verdigris	Basic copper acetate
Vermilion	Mercuric sulphide
Vinegar	Acetic acid
Vitriol, blue	Copper sulphate
" green	Ferrous sulphate
" oil of	Sulphuric acid
" white	Zinc sulphate
Volatile alkali	Ammonium hydroxide
White lead	Basic lead carbonate
Wood alcohol	Methyl alcohol
Zinc white	Zinc oxide

SPECIFIC GRAVITY.

To Convert Degrees Baumé into Specific Gravity.—(1) For liquids heavier than water: Subtract the degree of Baumé from 145 and divide into 145. The quotient is the specific gravity.

(2) For liquids lighter than water: Add the degree of Baumé to 130 and divide it into 140. The quotient is the specific gravity.

To Convert Specific Gravity into Degrees Baumé.—(1) For liquids heavier than water: Divide the specific gravity into 145 and subtract from 145. The remainder is the degree of Baumé.

(2) For liquids lighter than water: Divide the specific gravity into 140 and subtract 130 from the quotient. The remainder will be the degree of Baumé.

COMPARISON OF DEGREES TWADDELL AND SPECIFIC GRAVITY.

In order to change degrees Twaddell into specific gravity, multiply by 5, add 1,000 and divide by 1,000.

Example: Change 168 deg. Twaddell into specific gravity.

$$\begin{array}{r} 168 \times 5 \\ \hline 840 \\ 1{,}000 \\ \hline 1{,}000)1{,}840 \\ \hline 1.84, \text{ specific gravity.} \end{array}$$

To change specific gravity into degrees Twaddell, multiply by 1,000, subtract 1,000 and divide by 5.

Example: Change 1.84 specific gravity to degrees Twaddell.

$$\begin{array}{r} 1.84 \times 1{,}000 \\ 1{,}840 \\ 1{,}000 \\ \hline 5)840 \\ 168^\circ \text{ Tw.} \end{array}$$

SPECIFIC GRAVITY.

Determination of Specific Gravity: Solids; (1) Solids heavier than, and insoluble in water:

a. By weighing in air and water.—

$$\text{Sp. gr.} = \frac{\text{(weight in air)}}{\text{(loss of weight in water)}}$$

b. By Nicholson's hydrometer. Let w_1 be the weight required to sink the instrument to the mark on the stem; to take the specific gravity of any solid substance, place a portion of it weighing less than w_1 in the upper pan, with such additional weight, say w_3, as will cause the instrument to sink to the zero mark. The weight of the substance is then $w_1 - w_3$. Next transfer the substance to the lower pan, and again adjust with weight w_4 to the zero mark.

$$\text{Sp. gr.} = \frac{w_1 - w_3}{w_4 - w_3}$$

c. By the specific gravity bottle (applicable to powders). Weigh the flask filled to the mark with water, then place the substance, of known weight, in the flask, fill to the mark with water, and weigh again.

$$\text{Sp. gr.} = \frac{\text{weight of substance in air}}{\text{wt. in air} + \text{wt. of flask and water} - \text{wt. of flask filled with substance and water.}}$$

(2) Solids lighter than and insoluble in water. The solid is weighted with a piece of lead and weighed in water.

$$\text{Sp. gr.} = \frac{\text{(weight of substance in air)}}{\text{(wt. of lead in water)} - \text{(wt. of lead and substance in water)} + \text{(wt. of substance in air)}}$$

(3) Solids heavier than and soluble in water. Proceed as in 1 *a*, using instead of water some liquid without action on the solid.

(weight of bulk of liquid equal to substance) = (weight of substance in air) — (weight of substance in liquid).

$$\text{(wt. of bulk of water equal to substance)} = \frac{\text{(wt. of bulk of liquid equal to substance)}}{\text{(sp. gr. of liquid)}}$$

$$\text{Sp. gr.} = \frac{\text{(weight of substance in air)}}{\text{(weight of bulk of water equal to substance)}}$$

Liquids: (1) By the hydrometer.

(2) By the specific gravity bottle. Weigh the bottle filled to the mark with water, and again when filled to the mark with liquid.

$$\text{Sp. gr.} = \frac{\text{(weight of liquid and bottle)} - \text{(weight of bottle)}}{\text{(weight of water and bottle)} - \text{(weight of bottle)}}$$

Tables of Specific Gravity will be found under Weights and Measures.

SPECIFIC GRAVITY.

Tables showing a comparison of the degrees of Baumé, Cartier, and Beck's Areometers, with specific gravity degrees.

For Liquids Lighter than Water.

Degrees of Baumé, Cartier, Beck.	Baumé. Sp. Gr.	Cartier. Sp. Gr.	Beck. Sp. Gr.
0	....	....	1.0000
1	....	....	0.9941
2	....	....	0.9883
3	....	....	0.9826
4	....	....	0.9770
5	....	....	0.9714
6	....	....	0.9659
7	....	....	0.9604
8	....	....	0.9550
9	....	....	0.9497
10	1.000	....	0.9444
11	0.993	1.000	0.9392
12	0.986	0.992	0.9340
13	0.979	0.985	0.9289
14	0.973	0.977	0.9239
15	0.967	0.969	0.9189
16	0.960	0.962	0.9139
17	0.954	0.955	0.9090
18	0.948	0.948	0.9042
19	0.942	0.941	0.8994
20	0.935	0.934	0.8947
21	0.929	0.927	0.8900
22	0.924	0.920	0.8854
23	0.918	0.914	0.8808
24	0.912	0.908	0.8762
25	0.906	0.901	0.8717
26	0.901	0.895	0.8673
27	0.895	0.889	0.8629
28	0.889	0.883	0.8585
29	0.884	0.877	0.8542
30	0.879	0.871	0.8500
31	0.873	0.865	0.8457
32	0.868	0.859	0.8415
33	0.863	0.853	0.8374
34	0.858	0.848	0.8333
35	0.853	0.842	0.8292
36	0.848	0.837	0.8252
37	0.843	0.831	0.8212
38	0.838	0.826	0.8173
39	0.833	0.820	0.8133
40	0.829	0.815	0.8095
41	0.824	0.810	0.8061
42	0.819	0.805	0.8018
43	0.815	0.800	0.7981
44	0.810	....	0.7944
45	0.806	....	0.7907
46	0.801	....	0.7871
47	0.797	....	0.7834
48	0.792	....	0.7799
49	0.788	....	0.7763
50	0.784	....	0.7727
51	0.781	....	0.7692
52	0.776	....	0.7658
53	0.771	....	0.7623
54	0.769	....	0.7589
55	0.763	....	0.7556
56	0.759	....	0.7522
57	0.755	....	0.7489
58	0.751	....	0.7456
59	0.748	....	0.7423
60	0.744	....	0.7391
61	0.740	....	0.7359
62	0.736	....	0.7328

For Liquids Heavier than Water.

Degrees of Baumé, Beck.	Baumé. Sp. Gr.	Beck. Sp. Gr.
0	1.000	1.0000
1	1.007	1.0059
2	1.014	1.0119
3	1.020	1.0180
4	1.028	1.0241
5	1.034	1.0303
6	1.041	1.0366
7	1.049	1.0429
8	1.057	1.0494
9	1.064	1.0559
10	1.072	1.0625
11	1.080	1.0692
12	1.088	1.0759
13	1.096	1.0828
14	1.104	1.0897
15	1.113	1.0968
16	1.121	1.1039
17	1.130	1.1111
18	1.138	1.1184
19	1.147	1.1258
20	1.157	1.1333
21	1.166	1.1409
22	1.176	1.1486
23	1.185	1.1565
24	1.195	1.1644
25	1.205	1.1724
26	1.215	1.1806
27	1.225	1.1888
28	1.235	1.1972
29	1.245	1.2057
30	1.256	1.2143
31	1.267	1.2230
32	1.278	1.2319
33	1.289	1.2409
34	1.300	1.2500
35	1.312	1.2593
36	1.324	1.2680
37	1.337	1.2782
38	1.349	1.2879
39	1.361	1.2977
40	1.375	1.3077
41	1.388	1.3178
42	1.401	1.3281
43	1.414	1.3386
44	1.428	1.3492
45	1.442	1.3600
46	1.456	1.3710
47	1.470	1.3821
48	1.485	1.3934
49	1.500	1.4050
50	1.515	1.4167
51	1.531	1.4286
52	1.546	1.4407
53	1.562	1.4530
54	1.578	1.4655
55	1.596	1.4783
56	1.615	1.4912
57	1.634	1.5044
58	1.653	1.5179
59	1.671	1.5315
60	1.690	1.5454
61	1.709	1.5596
62	1.729	1.5741
63	1.750	1.5888
64	1.771	1.6038

THERMOMETER SCALES.

Much annoyance is caused by the great difference of thermometer scales in use in the different civilized countries. The scale of Reaumur prevails in Germany. As is well known, he divides the space between the freezing and boiling points into 80 deg. France uses that of Celsius, who graduated his scale on the decimal system. The most peculiar scale of all, however, is that of Fahrenheit, a renowned German physicist, who in 1714 or 1715, composed his scale, having ascertained that water can be cooled under the freezing point, without congealing. He therefore did not take the congealing point of water, but composed a mixture of equal parts of snow and sal ammoniac, about —14 deg. R. The conversion of any one of these scales to another is very simple, and easily made. To change a temperature as given by Fahrenheit's scale into the same as given by the centigrade scale subtract 32 deg. from Fahrenheit's degrees, and multiply the remainder by 5-9. The product will be the temperature in centigrade degrees.

To change from Fahrenheit's to Reaumur's scale, subtract 32 deg. from Fahrenheit's degrees, and multiply the remainder by 4-9. The product will be the temperature in Reaumur's degrees.

COMPARATIVE SCALES OF THERMOMETER.

C.	R.	F.	C.	R.	F.	C.	R.	F.
−30	−24.0	−22.0	14	11.2	57.2	58	46.4	136.4
−29	−23.2	−20.2	15	12.0	59.0	59	47.2	138.2
−28	−22.4	−18.4	16	12.8	60.8	60	48.0	140.0
−27	−21.6	−16.6	17	13.6	62.6	61	48.8	141.8
−26	−20.8	−14.8	18	14.4	64.4	62	49.6	143.6
−25	−20.0	−13.0	19	15.2	66.2	63	50.4	145.4
−24	−19.2	−11.2	20	16.0	68.0	64	51.2	147.2
−23	−18.4	−9.4	21	16.8	69.8	65	52.0	149.0
−22	−17.6	−7.6	22	17.6	71.6	66	52.8	150.8
−21	−16.8	−5.8	23	18.4	73.4	67	53.6	152.6
−20	−16.0	−4.0	24	19.2	75.2	68	54.4	154.4
−19	−15.2	−2.2	25	20.0	77.0	69	55.2	156.2
−18	−14.4	−0.4	26	20.8	78.8	70	56.0	158.0
−17	−13.6	1.4	27	21.6	80.6	71	56.8	159.8
−16	−12.8	3.2	28	22.4	82.4	72	57.6	161.6
−15	−12.0	5.0	29	23.2	84.2	73	58.4	163.4
−14	−11.2	6.8	30	24.0	86.0	74	59.2	165.2
−13	−10.4	8.6	31	24.8	87.8	75	60.0	167.0
−12	−9.6	10.4	32	25.6	89.6	76	60.8	168.8
−11	−8.8	12.2	33	26.4	91.4	77	61.6	170.6
−10	−8.0	14.0	34	27.2	93.2	78	62.4	172.4
−9	−7.2	15.8	35	28.0	95.0	79	63.2	174.2
−8	−6.4	17.6	36	28.8	96.8	80	64.0	176.0
−7	−5.6	19.4	37	29.6	98.6	81	64.8	177.8
−6	−4.8	21.2	38	30.4	100.4	82	65.6	179.6
−5	−4.0	23.0	39	31.2	102.2	83	66.4	181.4
−4	−3.2	24.8	40	32.0	104.0	84	67.2	183.2
−3	−2.4	26.6	41	32.8	105.8	85	68.0	185.0
−2	−1.6	28.4	42	33.6	107.6	86	68.8	186.8
−1	−0.8	30.2	43	34.4	109.4	87	69.6	188.6
0	0.0	32.0	44	35.2	111.2	88	70.4	190.4
1	0.8	33.8	45	36.0	113.0	89	71.2	192.2
2	1.6	35.6	46	36.8	114.8	90	72.0	194.0
3	2.4	37.4	47	37.6	116.6	91	72.8	195.8
4	3.2	39.2	48	38.4	118.4	92	73.6	197.6
5	4.0	41.0	49	39.2	120.2	93	74.4	199.4
6	4.8	42.8	50	40.0	122.0	94	75.2	201.2
7	5.6	44.6	51	40.8	123.8	95	76.0	203.0
8	6.4	46.4	52	41.6	125.6	96	76.8	204.8
9	7.2	48.2	53	42.4	127.4	97	77.6	206.6
10	8.0	50.0	54	43.2	129.2	98	78.4	208.4
11	8.8	51.8	55	44.0	131.5	99	79.2	210.2
12	9.6	53.6	56	44.8	132.8	100	80.0	212.0
13	10.4	55.4	57	45.6	134.6			

To change the temperature as given by the centigrade scale into the same as given by Fahrenheit, multiply the centigrade degrees by 9-5 and add 32 deg. to the product. The sum will be the temperature by Fahrenheit's scale.

To change from Reaumur's to Fahrenheit's scale, multiply the degrees on Reaumur's scale by 9-4 and add 32 deg. to the product. The sum will be the temperature by Fahrenheit's scale.

For those who wish to save themselves the trouble we have calculated the preceding comparative table.

CHAPTER II.

ASTRONOMY AND TIME.

EDITED BY A. RUSSELL BOND.

ASTRONOMICAL SYMBOLS AND ABBREVIATIONS.

☉	The Sun.	°	Degrees.
☾	The Moon.	′	Minutes of Arc.
☿	Mercury.	″	Seconds of Arc.
♀	Venus.	N. North.	S. South.
⊕ or ♁	The Earth.	E. East.	W. West.
♂	Mars.		
♃	Jupiter.		
♄	Saturn.		
♅	Uranus.		
♆	Neptune.		
☌	Conjunction.		
□	Quadrature.		
☍	Opposition.		
☊	Ascending Node.		
☋	Descending Node.		
h	Hours.		
m	Minutes of Time.		
s	Seconds of Time.		

			°
0.	♈	Aries	0
I.	♉	Taurus	30
II.	♊	Gemini	60
III.	♋	Cancer	90
IV.	♌	Leo	120
V.	♍	Virgo	150
VI.	♎	Libra	180
VII.	♏	Scorpio	210
VIII.	♐	Sagittarius	240
IX.	♑	Capricornus	270
X.	♒	Aquarius	300
XI.	♓	Pisces	330

THE EARTH.

The Earth rotates at a velocity of 15 degrees an hour (about 17.366 miles a minute at the Equator); 1° is therefore equal to 4 minutes. The Circumference of the Globe is about 24,855 miles, and the diameter about 7,900 miles. More exactly:

	miles.
Earth's Equatorial Semi-diameter =	3963.296
" Polar " " =	3949.790
" Mean " " =	3958.794
" Oblateness = $\frac{1}{300}$	
1° of latitude at pole =	69.407
1° " equator =	68.704

The temperature increases on an average about 1° F. for every 64 feet descent. But this amount is variable according to the locality, geological formation, and dip of strata. In the Calumet and Hecla Mines, observations show an increase of 1° in about every 125 feet. At Bendigo it is shown to be 1° per 80 feet of descent. At Ronchamp Collieries, on the other hand, the temperature increases 1° F. in only 49 feet.

The mean density of the earth is 5.53 times as great as that of an equal bulk of water.

Area in sq. miles:

Africa	11,514,000
North America	6,446,000
South America	6,837,000
Asia	14,710,000
Australasia	3,288,000
Europe	3,555,000
Polar Regions	4,888,800
Total	51,238,800

Total surface	196,971,984 sq. miles
Cubic contents	259,944,035,515 cubic miles
	Feet.
Greatest depth of sea (Pacific O.)	30,000
" " " (Atlantic)	27,366
Highest mountain (Himalaya)	29,002
Highest balloon ascent above the earth	37,000
" " " (without man)	95,280

By combining a large number of analyses of rocks of all sorts, F. W. Clarke has estimated the relative amounts of elements in the crust of the earth:

	Per cent.		Per cent.
Oxygen	47.02	Manganese	.07
Silicon	28.06	Sulphur	.07
Aluminium	8.16	Barium	.05
Iron	4.64	Strontium	.02
Calcium	3.50	Chromium	.01
Magnesium	2.62	Nickel	.01
Sodium	2.63	Lithium	.01
Potassium	2.32	Chlorine	.01
Titanium	.41	Fluorine	.01
Hydrogen	.17		
Carbon	.12		100
Phosphorus	.09		

—*Science Year Book.*

The Earth is not always at the same distance from the Sun. In the Nautical Almanac the sun's apparent semi-diameter is given for every day in the year. The apparent semi-diameter was 16′ 17″. 89 on January 1st, 1912, and on July 1st of the same year it was 15′ 45″. 68. This proves that a greater distance separates us from the sun in summer than in winter.

PERIHELION AND APHELION.—When the earth is nearest to the sun it is said to be in *Perihelion*, and when farthest from the sun it is said to be in *Aphelion.*

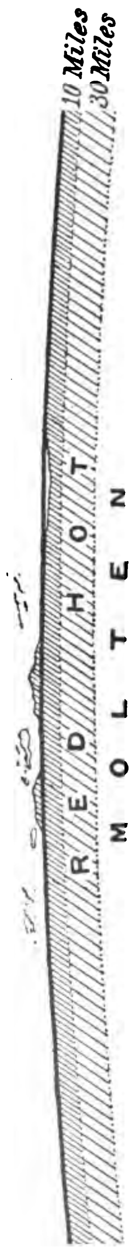
THE EARTH MOVES WITH VARYING VELOCITY IN ITS ORBIT.—This is ascertained by measuring the sun's longitude for two successive days at different times of the year, by which means it is found in December to move over 61′10.0″ within a period of twenty-four hours, while in June it only moves over 57′10.8″ in the same time.

KEPLER'S LAW OF EQUAL AREAS.—Kepler found that the line joining the center of the sun with the center of the earth moved over equal areas in equal times, that is, the greater distance of the earth from the sun in June compensated for the smaller arc of motion in longitude, so that lines drawn from the sun to the extremities of the arcs moved over make equal triangles.

Revolution of the Earth in its Orbit.—The stars which are seen nearest to the sun after sunset at different times of the year are not the same, but belong to different signs of the zodiac. This change of position of the sun with respect to the stars takes place at the rate of about 1° a day, so that the whole heavens appear to revolve once in a year independent of their diurnal revolution. This is due to the real revolution of the earth in its orbit. The stars appear to describe little ellipses in the course of a year, but, as a matter of fact, it is the light coming from the stars that is displaced by the motion of the earth in its orbit. This phenomenon is known as the *aberration of light*. There is also an apparent displacement of the nearer stars with respect to those more distant, which is known as *annular parallax* and is used to measure the distance of stars; for the greater the displacement the nearer must be the star.

The Moon.

The moon, our only satellite, is on the average 238,850 miles away, measuring from centre of the earth to the centre of the moon. Its maximum distance is 252,830 and minimum 221,520. After subtracting the semi-diameter of the earth, and the semi-diameter of the moon from this figure, we find that the minimum possible distance between the surfaces of the planets is 216,476 miles. The moon is only 2,162 miles in diameter, and its surface area is 14,685,000 miles, or a little less than the combined areas of North and South America. The volume of the earth is 49 times that of the moon and its weight, or more strictly speaking, its mass, is 81 times greater. A man weighing 140 pounds on earth would weigh but 21 pounds on the moon. The surface of the moon is covered with tall mountains reaching 20,000 feet high, with deep craters and crevasses. The moon has no atmosphere and apparently is a dead world. It revolves about the earth once in 27d., 7h., 43m., 11.55s. or 27.32166 days. However, as the earth is also revolving about the sun the synodical period or the time from new moon to new moon is 29d., 12h., 44m., 2.86s. or 29.53059 days. During the synodical period the moon makes one complete rotation about its axis, and hence the moon's day is almost a month long. During this period it keeps the same face always toward the earth. However, we can see more than half of the moon because the moon's axis is inclined 5° 8′ from the perpendicular to its orbit, so that we can see alternately its north and south pole. Also because its angular velocity about its orbit varies, we can see a little more now of the western side and now of the eastern. The moon does not revolve about the centre of the earth, but about a centre of gravity common to both earth and moon. This centre is 1,063 miles below the surface of the earth. The earth's revolutions about this centre are known as *librations*. The plane of the moon's orbit is also inclined to the earth's orbit 5° 5′. The points where this plane crosses the plane of the earth's orbit are called the *nodes*. Eclipses occur only when the moon is at or near the nodes. For only then can its shadow fall on the earth or the earth's shadow fall on the moon. The nodes are not fixed, but move at the rate of one complete revolution in 18y., 218d., 21h., 22m., 46s. This period was known to the ancients as a *saros* for it was noted that eclipses repeated themselves at the lapse of such a period.



SECTION OF THE EARTH.

Showing approximately the curvature, the relative heights of the loftiest mountains and highest clouds, the greatest depth of the ocean, and the thickness of the solid crust.

The thickness of the black line suggests the limits practically inhabited by man, *i.e.*, from the bottom of the deepest mine to the highest habitation in Europe, about 10,000 feet.

At an elevation of about seven miles (36,000 feet) the atmospheric pressure is one-third that at sea level, so that two-thirds of the atmosphere is below this line, the remainder extending upwards in increasing attenuated form. At about this height is the "isothermal layer," above which the temperature of the air changes but little.

Presuming the temperature to increase at a rate of 1° F. for each 60 feet of descent into the earth (a general average as found at depths up to 1 mile), then at 10 miles all would be at red-heat, and at 30 miles a temperature would be reached at which all known substances would be in a molten state. But this increase of temperature is, of course, solely a matter of conjecture, and many theoriess deny the possibility of this thin crust of solid earth enclosing so vast a bulk of molten and liquid matter. The pressure of the superincumbent crust may also raise the melting point of mineral matter down below.

The Sun.

—Solar Parallax (equatorial horizontal), 8.80″±0.02″. Mean distance of the sun from the earth, 92,885,000 miles; 149,480,000 kilometers. Variation of the distance of the sun from the earth between January and July, 3,100,000 miles; 4,950,000 kilometers. Linear value of 1″ on the sun's surface, 450.3 miles; 724.7 kilometers. Mean angular semi-diameter of the sun, 16′ 02.0″. Sun's linear diameter, 866,400 miles; 1,394,300 kilometers. (This may, perhaps, be *variable* to the extent of several hundred miles.) Ratio of the sun's diameter to the earth's 109.3. Surface of the sun compared with the earth, 11,940. Volume, or cubic contents, of the sun compared with the earth, 1,305,000. Mass, or quantity of matter, of the sun compared with the earth, 330,000±3000. Mean density of the sun compared with the earth, 0.253. Mean density of the sun compared with water, 1.406. Force of gravity on the sun's surface compared with that on the earth, 27.6. Distance a body would fall in one second, 444.4 feet; 135.5 meters. Inclination of the sun's axis to the ecliptic, 70° 15′. Longitude of its ascending node 74°. Date when the sun is at the node, June 4, 5. Mean time of the sun's rotation (Carrington), 25.38 days. Time of rotation of the sun's equator, 25 days. Time of rotation at latitude 20°, 25.75 days. Time of rotation at latitude 30°, 26.5 days. Time of rotation at latitude 45°, 27.5 days. (These last four numbers are somewhat doubtful, the formulæ of various authorities giving results differing by several hours in some cases.) Linear velocity of the sun's rotation at its equator, 1.261 miles per second; 2.028 kilometers per second. Total quantity of sunlight, 1,575,-000,000,000,000,000,000,000,000 candles. Intensity of the sunlight at the surface of the sun, 190,000 times that of a candle flame; 5300 times that of metal in a Bessemer convertor; 146 times that of a calcium light; 3.4 times that of an electric arc. Brightness of a point on the sun's limb compared with that of a point near the center of the disk, 25 per cent. Heat received per minute from the sun upon a square meter, perpendicularly exposed to the solar radiation, at the upper surface of the earth's atmosphere (*the solar constant*), 20 calories. Heat radiation at the surface of the sun, per square meter per minute, 1,117,-000 calories. Thickness of a shell of ice which would be melted from the surface of the sun per minute, 48½ feet, or 14¾ meters. Mechanical equivalent of the solar radiation at the sun's surface, continuously acting, 109,000 horse power per square meter; or, 10,000 (nearly) per square foot. Effective temperature of the solar surface about 5,000° C., or 9,000° F.

Ecliptic.—If the brilliance of the sun did not obscure the stars, in other words, if we were able to see the stars by day as we do at night, we should note that the sun travels eastward among them, making a complete revolution in a year. The path of the sun among the stars is known as the "Ecliptic." The angle (23½°) between the plane of the ecliptic and that of the celestial equator is known as the *obliquity of the ecliptic.* The sun's motion is only apparent. The plane of the ecliptic is really the plane of the earth's revolution about the sun, while the plane of the celestial equator is the plane of the earth's rotation on its axis.

Nodes.—The two points where the plane of the ecliptic crosses the plane of the celestial equator or equinoctial are called *nodes*, that point at which the sun appears to come up from below the equator being called the *ascending node*, and that at which the sun appears to descend from above the same plane being called the *descending node.*

The First Point of Aries.—The *ascending node* above referred to is the *first point of Aries.* It is universally used for fixing the right ascension of celestial bodies.

Precession and Nutation.—The sun and moon attract the protuberant portion of the earth's equator more on that side nearest to them than on that side farthest away, and in this way the differential attraction tends to tilt the axis a little, so that it describes a circle in about 25,800 years. The moon's differential attraction is greater than that of the sun. On account of the moon's continually changing its relation to the earth's equator, it causes the axis of the earth to describe a circle with a wavy circumference, known as *nutation*, or nodding of the earth's axis.

Latitude, Longitude, Right Ascension, and Declination.—Terrestrial latitude is measured from the equator to the poles, north and south. Terrestrial longitude is commonly measured from the meridian of Greenwich, but some countries use their own meridians. Right ascension is measured from the first point of Aries. Declination is measured from the celestial equator. Celestial longitude is measured from the first point of Aries, celestial latitude from the ecliptic.

SATELLITES OF THE SOLAR SYSTEM

Name	Stellar Magnitude	Mean Distance in Miles	Sidereal Period d. h. m. s.	Discoverer	Date
THE EARTH					
The Moon..	..	238,840	27 7 43 11		
MARS					
1. Phobos....	14	5,850	7 39 15	Asaph Hall....	Aug. 17, 1877
2. Deimos....	13	14,650	1 6 17 54	Asaph Hall....	Aug. 11, 1877
JUPITER					
5. (Nameless).	13	112,500	11 57 23	Barnard......	Sept. 9, 1892
1. Io.........	6½	261,000	1 18 27 33	Galileo.......	Jan. 7, 1610
2. Europa....	6½	415,000	3 13 13 42	Galileo.......	Jan. 8, 1610
3. Ganymede .	6	664,000	7 3 43 33	Galileo.......	Jan. 7, 1610
4. Callisto....	7	1,167,000	16 16 32 11	Galileo.......	Jan. 7, 1610
6. (Nameless).	14	7,000,000	250 d.	Perrine.......	Dec. 1904
7. (Nameless).	16	7,300,000	265 d.	Perrine.......	Jan. 1903
8. (Nameless).	17	15,600,000	789 d.	Melotte......	Jan. 1908
SATURN					
1. Mimas.....	15	117,000	22 37 6	W. Herschel...	July 18, 1789
2. Enceladus..	14	157,000	1 8 53 7	W. Herschel...	Aug. 29, 1789
3. Tethys.....	11	186,000	1 21 18 26	J. D. Cassini...	Mar. 21, 1684
4. Dione......	11	238,000	2 17 41 9	J. D. Cassini...	Mar. 21, 1684
5. Rhea.......	10	332,000	4 12 25 12	J. D. Cassini...	Dec. 23, 1672
6. Titan......	9	771,000	15 22 41 23	Huygens......	Mar. 25, 1655
7. Hyperion...	16	934,000	21 6 39 27	G. P. Bond....	Sept. 16, 1848
8. Iapetus....	11	2,225,000	79 7 54 17	J. D. Cassini...	Oct. 25, 1671
9. Phoebe.....	17	8,000,000	546.5 d.	W.H.Pickering	1898
10. Themis.....	17	906,000	20 20 24 0	W.H.Pickering	1905
URANUS					
1. Ariel.......	15	120,000	2 12 29 21	Lassell........	Oct. 24, 1851
2. Umbriel....	16	167,000	4 3 27 37	Lassell........	Oct. 24, 1851
3. Titania.....	13	273,000	8 16 56 29	W. Herschel...	Jan. 11, 1787
4. Oberon.....	14	365,000	13 11 7 6	W. Herschel...	Jan. 11, 1787
NEPTUNE					
1. (Nameless)	13	221,500	5 21 2 44	Lassell........	Oct. 10, 1846

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PRINCIPAL ELEMENTS OF THE SOLAR SYSTEM.

Name	Mean Distance from Sun		Sidereal Period		Mean Diam't'r Miles	Mass	Density	Volume	Axial Rotation
	⊕ = 1	Millions of Miles	Mean Solar Days	Years		⊕ = 1	Water = 1	⊕ = 1	
☿ Mercury .	0 387	36.0	87 97	0 24	3030	0 476	4.7(?)	0 056	88^d
♀ Venus.	0 723	67.2	224 70	0 62	7700	0 82	4.94	0.92	225^d
⊕ Earth....	1 000	92 9	365 26	1 00	7917 6	1 00	5.55	1 00	$23^h\ 56^m\ 4^s$
♂ Mars. ...	1 524	141 5	686.95	1 88	4230	0 108	3 92	0 152	$24^h\ 37^m\ 23^s$
♃ Jupiter...	5 203	483 3	4332 58	11 86	86500	317 7	1 32	1309	$9^h\ 55^m$ ±
♄ Saturn.....	9 539	886 0	10759 2	29 46	73000	94 8	0 72	760	$10^h\ 14^m$ ±
♅ Uranus ..	19 183	1781 9	30686 8	84 02	31900	14 6	1 22	65	?
♆ Neptune...	30 055	2971 6	60181 1	164 78	34800	17 0	1 11	85	?
☉ Sun . .	...		....	...	866400	332000	1.39	1300000	$25^d\ 7^h\ 48^m$ ±
☾ Moon ..	From⊕238,840mls		27..32	0.75	2163	1/81.5	3 39	0 020	$27^d\ 7^h\ 43^m$

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PERIODIC COMETS.

Name.	Perihelion Passage.	Period (Years.)	Perihelion Dist. Earth's Orbit = 1.	Eccentricity.
Encke	1885, Mar. 7	3.3	0.34	0.846
Tempel	1883, Nov. 20	5.2	1.34	0.553
Barnard	1890, Feb. 17	5.4	1.28	0.582
Tempel-Swift	1886, May 9	5.5	1.07	0.656
Brorsen	1879, Mar. 30	5.5	0.59	0.810
Winnecke	1886, Sept. 4	5.8	0.88	0.727
Tempel	1885, Sept. 25	6.5	2.07	0.405
Biela	1882, Sept. 23	6.6	0.86	0.755
D'Arrest	1884, Jan. 13	6.7	1.33	0.626
Faye	1881, Jan. 22	7.6	1.74	0.549
Tuttle	1885, Sept. 11	13.8	1.02	0.821
Pons-Brooks	1884, Jan. 25	71.5	0.77	0.955
Olbers	1887, Oct. 8	72.6	1.20	0.931
Halley	1910, Apr. 19	74.4	0.59	0.967

Shooting Stars.—The names of the principal meteor swarms and the dates of their appearance are as follows:—

Name.	Date.	Comet having same Orbit.
Andromedes .	23 November	Biela's
Lyrids.......	20 April.....	Comet I. 1861
Leonids......	15 November	Tempel's, 1866
Perseids.....	11 August. ..	Comet III. 1863

Light Year

The distance that light can travel in a year is called a "Light Year" and is used by astronomers as a unit of linear measure.

Light travels in

1 second............	186,330 miles
1 minute............	11,179,800 "
1 hour..............	670,788,000 "
1 day...............	16,098,912,000 "
1 year..............	588,022,995,000 "

The earth's mean distance from the sun is also used as a unit of linear measure.

GREEK ALPHABET.

The different stars of the several constellations are usually indicated by the letters of the Greek alphabet. For convenience of reference, the alphabet is here given.

Α α Alpha.	Η η Eta.	Ν ν Nu.	Τ τ Tau.
Β β Beta.	Θ θ Theta.	Ξ ξ Xi.	Υ υ Upsilon.
Γ γ Gamma.	Ι ι Iota.	Ο ο Omicron.	Φ φ Phi.
Δ δ Delta.	Κ κ Kappa.	Π π Pi.	Χ χ Chi.
Ε ε Epsilon.	Λ λ Lambda	Ρ ρ Rho.	Ψ ψ Psi.
Ζ ζ Zeta.	Μ μ Mu.	Σ ς Sigma.	Ω ω Omega.

NAMES OF THE PRINCIPAL STARS.

The following table exhibits the names of all the Stars of the First Three Magnitudes to which Astronomers have given names, at least all those whose names are in common use.

α	Andromedæ—Andromeda	Alpheratz.
β	"	Mirach Mizar.
γ	"	Almach.
α	Aquarii—Water Bearer	Sadalmelik.
β	"	Sadalsund.
δ	"	Skat.
α	Aquilæ—Eagle	Altair.
β	"	Alshain.
γ	"	Tarazed.
α	Arietis—Ram	Hamal.
β	"	Sheratan.
γ	"	Mesartim.
α	Aurigæ—Charioteer	Capella.
β	"	Menkalinan.
α	Boötis—Herdsman	Arcturus.
β	"	Nekkar.
ε	"	Izar, Mizar, Mirach.
η	"	Muphrid.
α	Canis Majoris—Great Dog	Sirius.
β	" "	Mirzam.
ε	" "	Adara.
β	Cygni—Swan	Albireo.
α	Draconis—Dragon	Thuban.
β	"	Alwaid.
γ	"	Etanin.
β	Eridani—River Eridanus	Cursa.
γ	"	Zaurac.
α	Geminorum—Twins	Castor.
β	"	Pollux.
γ	"	Alhena.
δ	"	Wesat.
ε	"	Mebsuta.
α	Herculis—Hercules	Ras Algethi.
β	"	Korneforos.
α	Hydræ—Sea Serpent	Al Fard, Cor Hydræ.
α	Leonis—Lion	Regulus, Cor Leonis.
β	"	Deneb Aleet, Denedola, Deneb.
γ	"	Algeiba.
δ	"	Zosma.
α	Leporis—Wolf	Arneb.
α	Libræ—Scales	Zuben el Genubi.
β	"	Zuben el Chamali.
γ	"	Zuben Hakrabi.
α	Lyræ—Lyre	Vega.
β	"	Sheliak.
γ	"	Sulaphat.
α	Ophiuchi—Serpent Bearer	Ras Alhague.
β	"	Cebalrai.
α	Orionis—Orion	Betelgeux.
β	"	Rigel.
γ	"	Bellatrix.
α	Canis Minoris—Little Dog	Procyon.
β	" "	Gomeisa.
α	Canum Venaticorum — Hunting Dogs	Cor Caroli.
α^2	Capricorni—Sea Goat	Secunda Giedi.
δ	"	Deneb Algiedi.
α	Cassiopeiæ—Cassiopeia	Schedar.
β	"	Chaph.
α	Cephei—Cepheus	Alderamin.
β	"	Alphirk.
γ	"	Errai.
α	Ceti—Whale	Menkar.
β	"	Diphda.
ζ	"	Baten Kaitos
ο	"	Mira.
α	Columbæ—Dove	Phact.
α	Coronæ Borealis—Crown	Alphecca.
α	Corvi—Crow	Alchiba.
δ	"	Algores.
α	Crateris—Cup	Alkes.
α	Cygni—Swan	Arided, Deneb Adige.
δ	Orionis—Orion	Mintaka.
ε	"	Alnilam.
α	Pegasi—Pegasus	Markab.
β	"	Scheat.
γ	"	Algenib.
ε	"	Enif.
ζ	"	Homan.
α	Persei—Perseus	Mirfak.
β	"	Algol.
α	Piscis Australis—Southern Fish	Fomalhaut.
ε	Sagittarii—Archer	Kaus Australis.
α	Scorpionis—Scorpion	Antares, Cor Scorpionis.
α	Serpentis—Serpent	Unukalhai.
α	Tauri—Bull	Aldebaran.
β	"	Nath.
η	"	Alcyone (Pleiad).
α	Ursæ Majoris—Great Bear	Dubhe.
β	" "	Merak.
γ	" "	Phecda.
ε	" "	Alioth.
ζ	" "	Mizar.
η	" "	Alkaid, Benetnasch.
ι	" "	Talitha.
α	Ursæ Minoris—Little Bear	Polaris.
β	" "	Kochab.
α	Virginis—Virgin	Spica Azimech, Spica.
β	"	Zavijava.
ε	"	Vindemiatrix

In designating a star instead of writing α of Ursa Major or α of Gemini or α of Cassiopeia, it is customary to use the genitive form of the constellation name. Thus: α Ursae Majoris, α Geminorum, α Cassiopeiæ, etc.

STARS ARRANGED IN THE ORDER OF THEIR MAGNITUDE DOWN TO AND INCLUDING POLARIS

NAME OF STAR	Magnitude	R. A.			Dec.		
		h	m	s	°	′	″
α Canis Majoris—(*Sirius*)	−1.6	6	41	16	−16	35	41
α Argûs—(*Canopus*)	−0.9	6	22		−52	38	50
α Centauri	0.1	14	33	37	−60	28	22
α Lyrae—*Vega*)	0.1	18	33	58	+38	42	4
α Boötis—(*Arcturus*)	0.2	14	11	38	+19	38	25
α Aurigæ—(*Capella*)	0.2	5	10	11	+45	54	34
β Orionis—(*Rigel*)	0.3	5	10	18	−8	18	9
α Canis Minoris—(*Procyon*)	0.5	7	34	42	+5	27	4
α Aquilae—(*Altair*)	0.9	19	46	29	+8	38	7
β Centauri	0.9	13	57	36	−59	56	56
α Orionis—(*Betelgeux*)	0.9	5	50	24	+7	23	29
α Eridani—(*Achernar*)	1	1	34	26	−57	41	1
α Tauri—(*Aldebaran*)	1.1	4	30	52	+16	19	59
β Geminorum—(*Pollux*)	1.2	7	39	56	+28	14	22
α Scorpionis—(*Antares*)	1.2	16	24	1	−26	14	15
α Virginis—(*Spica*)	1.2	13	20	33	−10	42	8
α Cygni—(*Deneb*)	1.3	20	38	26	+44	57	55
α Leonis—(*Regulus*)	1.3	10	3	41	+12	23	51
α Pisc. Aust.—(*Fomalhaut*)	1.3	22	52	47	−30	5	20
β Crucis	1.5	12	42	34	−59	12	28
ε Canis Majoris	1.6	6	55	10	−28	51	6
α Crucis	1.6	12	21	42	−62	36	41
γ Crucis	1.6	12	26	17	−56	37	13
ε Argus	1.7	8	20	43	−59	13	34
γ Orionis—(*Bellatrix*)	1.7	5	20	25	+6	16	14
λ Scorpionis	1.7	17	27	38	−37	2	25
ε Ursae Majoris—(*Alioth*)	1.7	12	50	10	+56	26	14
β Argûs	1.8	9	12	14	−69	21	17
ε Orionis—(*Alnilam*)	1.8	5	31	45	−1	15	26
β Tauri	1.8	5	20	44	+28	32	2
γ Geminorum	1.9	6	32	38	+16	28	31
α Persei—(*Algenib*)	1.9	3	18	2	+49	32	56
α Triang. Aust.	1.9	16	39	20	−68	52	3
η Ursae Majoris—(*Alkaid*)	1.9	13	44	5	+49	45	8
δ Argûs	2	8	42	16	−54	23	9
β Canis Majoris	2	6	18	49	−17	54	41
δ Canis Majoris	2	7	4	49	−26	15	10
α Geminorum—(*Castor*)	2	7	28	59	+32	4	57
δ Orionis	2	5	36	19	−1	59	19
ε Sagittarii	2	18	18	20	−34	25	37
α Ursae Majoris—(*Dubhe*)	2	10	58	18	+62	13	35
β Aurigae	2.1	5	53	4	+44	56	22
α Ophiuchi	2.1	17	30	51	+12	37	24
α Pavonis	2.1	20	18	42	−57	1	4
ε Sagittarii	2.1	18	49	59	−26	24	25
α Ursae Minoris—(*Polaris*)	2.1	1	27	51	+88	50	11

DISTANCES OF THE NEARER STARS.

α Centauri	4.3	Light years
Lalande 21,185	8.1	“ “
α Canis Majoris (*Sirius*)	8.7	“ “
τ Ceti	9.8	“ “
α Canis Minoris	10.1	“ “
61 Cygni	10.5	“ “
Groombridge 34	11.6	“ “
α Aquilae	13.7	“ “
Lalande 21,258	16.1	“ “
η Cassiopeiae	16.2	“ “
ξ Ursae Majoris	18.2	“ “
o Eridani	18.8	“ “
ζ Herculis	22.9	“ “
o Ceti (*Mira*)	22.9	“ “
α Pisc. Aust. (*Fomalhaut*)	23.6	“ “
β Leonis (*Denebola*)	25.3	Light years
β Virginis	27.6	“ “
μ Cassiopeiae	29.1	“ “
γ Draconis	30.5	“ “
μ Herculis	30.8	“ “
γ Cygni	30.8	“ “
Groombridge 1830	32.0	“ “
α Lyrae (*Vega*)	34.7	“ “
θ Ursae Majoris	35.5	“ “
α Boötis (*Arcturus*)	43.5	“ “
β Cassiopeiae	44.1	“ “
α Ophiuchi	44.1	“ “
α Tauri (*Aldebaran*)	44.7	“ “
α Aurigae	49.4	“ “
β Gemini	50.9	“ “

THE NORTHERN HEAVENS.

The maps shown on the following pages represent the heavens as seen, on the different dates given, from stations in and about the latitude of New York (40° N). It is not an easy matter to recognize the stars by looking at the map. A certain amount of study is necessary; for, of course, the different stars of a constellation are not linked together by lines as they are in the map and furthermore their magnitude is very much exaggerated. The best plan for the novice is to start with a well known constellation, such as that of the Great Bear. The "Dipper" which is a part of the Great Bear is so conspicuous a group in the northern skies that anyone can point it out. Knowing the Dipper, the Pole Star may readily be discovered by tracing a line from β through α of the Dipper and about five times as far. Around the Pole Star (Polaris) which is of the second magnitude, the entire northern heavens appear to revolve once a day. Having found the Pole Star the constellation of Cassiopeia may be found by extending a line from ϵ of the Dipper through the Pole Star and as far again to the other side, where a cluster of stars in the form of a large ragged *W* will be found. If we run a line diagonally from α of the Dipper through γ and about eight or nine times as far again, we shall come to the first magnitude star Spica, in the constellation of the Virgin, while a line extended from α through β and about eight times as far again will bring us in the midst of the constellation of the Lion. At the eastern end of this constellation, is the second magnitude star Denebola, and the distance from this star to Spica is about the same as that from Spica to Arcturus, the first magnitude star in the constellation of Boötes. Thus we may proceed building up our knowledge of various groups and using these groups as reference points to find new constellations.

THE "DIPPER" AS AN INDEX TO THE HEAVENS.

Contrary to custom in geographical maps, our star maps are drawn with the east on the lefthand side and the west on the righthand side, while north is at the top of the page and south at the bottom. This is due to the fact that the heavens are viewed looking upward, while the geographical map is viewed looking downward. In locating stars and constellations, it is best to hold the map overhead when the actual points of the compass and those marked on the map will bear the true relation to each other.

NIGHT SKY: JANUARY AND FEBRUARY.

If one views the heavens on the hours specified under our map of January, he will find almost directly overhead a bright star with a triangle of lesser stars beside it. The bright star is Capella or the Little She Goat which is held on the arm of Auriga, the Charioteer, whose left hand is represented by the triangle of stars, η, ϵ, ζ. The constellation bears no resemblance whatever to a charioteer or a goat. In fact, very few constellations bear any resemblance to the objects the ancients supposed them to represent. Halfway between Capella and the southern horizon are the three bright stars forming the belt of Orion. They are indicated in the map ζ, ϵ, δ, and they are centered in the square formed by the stars, Betelgeux, Bellatrix, Rigel and the star noted by the letter κ. The little triangle of stars at λ mark the head of Orion, while the line of faint stars at π represents a lion skin that Orion is holding forth towards the constellation of Taurus, the Bull. The principal star of this constellation is Aldebaran, a bright red star, marking the left eye of the bull, while his two horns are indicated by the stars β and ζ. The star ϵ is at the right eye of the bull, and γ at his nose. They form with Aldebaran a triangle that is easily recognizable. A little to the west of this group is the interesting star cluster of the Pleiades. In this cluster, there are six stars easily visible to the naked eye, and many can see seven stars, while observers with exceptionally good eyesight have been able to see as many as fourteen stars. A small spyglass will reveal large numbers.

The stars forming the belt of Orion point in the general direction of the first magnitude star Sirius in the constellation of Canis Major, the Great Dog. Sirius is by far the brightest object in the heavens if we exclude the sun, moon and planets. It is one of the nearest suns outside our solar system, yet it is so far off that it takes nearly nine years for its light to reach us. The diameter of Sirius is about twenty times that of the sun and its volume is about seven thousand times greater. In the constellation of Canis Major there are

At 11 o'clock: Jan. 7
" 10:30 " " 14
" 10 " " 22

At 9 o'clock: Feb. 6
" 8:30 " " 14
" 8 " " 21

At 9:30 o'clock: January 29

NIGHT SKY: JANUARY AND FEBRUARY.

two other first magnitude stars, but Sirius so far outshines them that they look no brighter than second magnitude stars. If we follow the line from Aldebaran eastward beyond ζ we come to the constellation of Gemini, the Twins, marked by the two bright stars, Castor and Pollux; while south of this constellation is the first magnitude star Procyon in the constellation of Canis Minor, the Little Dog. It will be noticed that most of the constellations so far referred to lie adjacent to the Milky Way. If we follow the Galaxy northward, we find just beyond the constellation of Auriga, the constellation of Perseus, whose most interesting star is marked β and is known as Algol, the Demon Star or the Winking Demon. Every two days, twenty hours and forty-nine minutes, this star begins to fade until, in the course of three or four hours, it loses four-fifths of its light. Then it begins to become brighter until eventually, after three or four hours more, it reaches its normal brilliancy. The star marks the head of Medusa, which according to the Greek legend Perseus was carrying when he came across Andromeda chained to the rock. Further north along the Milky Way we come to Cassiopeia.

In the northeast is the great dipper forming part of Ursa Major, the Great Bear; far in the east is the constellation of Leo, the Lion, in which are the prominent stars Regulus, Denebola. The curved line of stars ending with Regulus is known as the Sickle.

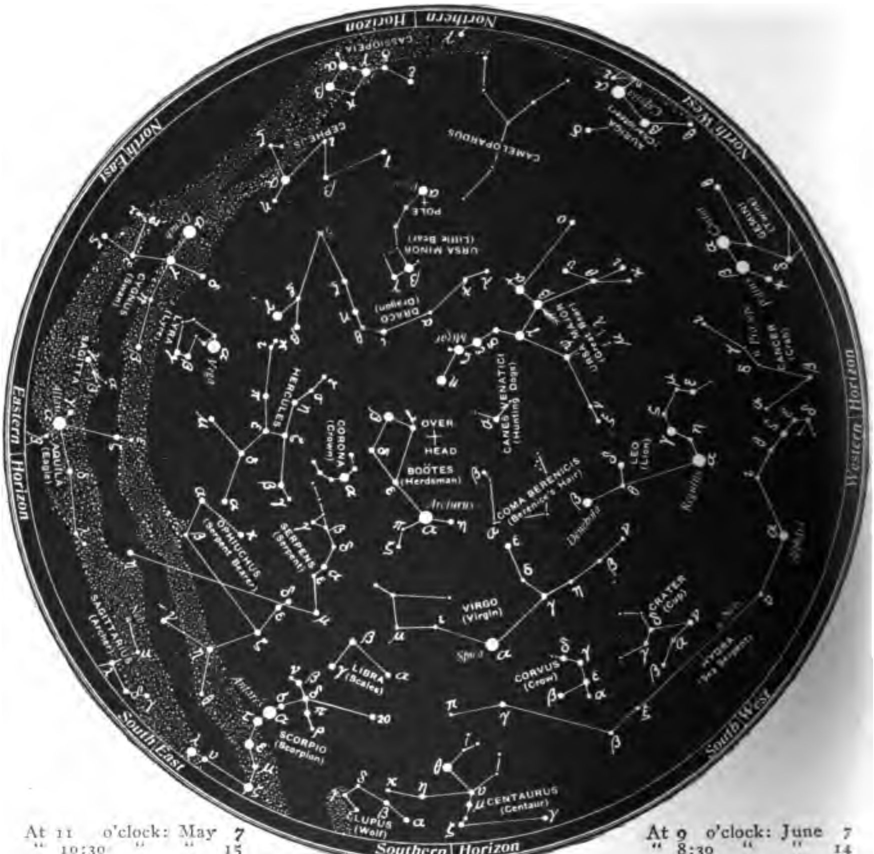
At 11 o'clock Mar. 8
" 10:30 " " 16
" 10 " " 23

At 9 o'clock Apr. 7
" 8:30 " " 14
" 8 " " 22

At 9:30 o'clock: March 30

NIGHT SKY: MARCH AND APRIL.

Our map for March and April shows most of the constellations along the Milky Way low in the western sky. The great dipper is well up near the zenith with its pointer stars β and α indicating the position of the Pole Star, Polaris. Oddly enough the ancients represented the great bear as having a long tail, indicated by the stars ϵ, ζ, η. These are the only stars that follow the outline of the beast. The star o is at the bear's mouth, while the stars κ, ι, and μ, λ, and ν, ξ represent three of his feet. The star ζ is interesting because it has a small companion, called by the Arabs as "Alcor." A little to the south of the zenith is the constellation of Leo, referred to in the previous paragraph. Below Leo are two small groups known as Corvus, the Crow, and Crater, the Cup. They are not very conspicuous; neither is Hydra, the Sea Serpent, which stretches its long length across the southern sky. Its brightest star is Alphard which is of the second magnitude. Above the head of the serpent is the inconspicuous constellation of Cancer, the Crab. An interesting feature of this constellation is a faint star cluster, just visible to the naked eye and marked on the map Praesepe, the "Beehive." In the telescope this is seen to be made up of a myriad of small bright stars.



At 11 o'clock: May 7
" 10:30 " " 15
" 10 " " 22

At 9 o'clock: June 7
" 8:30 " " 14
" 8 " " 22

At 9:30 o'clock: May 30

THE NIGHT SKY OF MAY AND JUNE.

The constellation nearest the zenith in May and June is that of Boötes, or the Herdsman. A bright red star, Arcturus, may be found in this constellation. It is known as the Wandering Star for the reason that it is slowly drifting with respect to the other stars in the Heavens. Since the time of Christ it has moved in a southwesterly direction, fully one degree, or through a distance equal to twice the diameter of the moon. Its yearly displacement is two seconds of arc. South of Boötes is the constellation of Virgo, whose brightest star is Spica. Between Virgo and Ursa Major are two faint constellations known as Coma Berenicis, Berenice's Hair, and Canes Venatici, the Hunting Dogs. Close to the southern horizon is the constellation of Centaurus. the Centaur. Not very much of this constellation can be seen from our latitude. Its brightest stars lie below the horizon. They include α Centauri, the nearest body outside the solar system. This star is only 255,000 times as far from us as we are from the sun. It takes its light 4⅓ years to come to us. In the southeast, low down near the horizon may be seen the constellation of Scorpio, the Scorpion. This constellation is made up of a very easily recognizable group of stars. It contains the brilliant first magnitude star, Antares, at each side of which are the lesser stars σ and τ. A line of stars traces the form of the Scorpion as shown to better advantage in the next map. The Scorpion embraces in its claws the constellation Libra, or the Scales. In the north above the Polar Star, we may see

the body of the Little Bear, Ursa Minor. Most of the stars of this constellation are faint with the exception of Polaris and two stars β and γ which have been called the guards. Between Ursa Minor and the Zenith, the constellation Draco, or the Dragon, twines its long form. The stars γ, β and ξ mark the head of the dragon. To the eastward of the constellation Boötes is a partial ring of stars known as Corona, or the Crown. This is one of the few groups actually outlining the object it is supposed to represent.

At 11 o'clock: July 7
" 10:30 " " 14
" 10 " " 22

At 9 o'clock: Aug. 7
" 8:30 " " 14
" 8 " " 22

At 9:30 o'clock: July 30

NIGHT SKY: JULY AND AUGUST.

The Zenith constellation for July and August is Lyra, the Lyre, with its bright blue-white star, Vega, nearly directly overhead. Just west of the Zenith is the constellation Hercules whose stars form a ragged-looking *H*. Below this constellation is Ophiuchus who has in his grasp the constellation Serpens or the Serpent. Low down in the south the constellation of Scorpio has dragged its full length above the horizon and it is easy to trace its body and tail ending with the stars λ and ν. The opposite side of the Milky Way now stretches its length across the sky, containing in its extent many brilliant constellations. Just east of Scorpio is the constellation of Sagittarius, the Archer. Well up in the southeast is the star Altair of the constellation Aquila, the Eagle, and just above Altair is the tiny constellation, Sagitta or the Arrow. To the east may be seen Delphinus, the Dolphin, while to the east of Lyra is the constellation of Cygnus, the Swan.

At 11 o'clock: Sept. 6
" 10:30 " " 14
" 10 " " 21

At 9 o'clock: June 7
" 8:30 " " 14
" 8 " " 22

At 9:30 o'clock: September 29

NIGHT SKY: SEPTEMBER AND OCTOBER.

Our map for these two months shows no constellation immediately overhead. Halfway between the Zenith and the Pole Star is the constellation of Cephus, a badly formed *W* made up of stars that are not very bright, with the exception of α which is of second magnitude. The Milky Way now stretches overhead and makes a beautiful sight on a moonless night. About thirty degrees south of the Zenith is the constellation Pegasus. Its three stars, γ, α, and β form with the star α of the constellation Andromeda, a large square known as the "Square of Pegasus." Below the constellation Pegasus is that of Aquarius, the Water Bearer, while to the southwest is the zodiacal constellation of Capricornus, the Sea Goat. This constellation is marked by a very pretty naked eye double at α. The most conspicuous star in the south is Fomalhaut, of the Southern Fish. This brilliant star can hardly be appreciated in northern latitudes because it is not very favorably placed for observation. Below Fomalhaut is a bright little group known as Grus, the Crane.

At 11 o'clock: Nov. 7
" 10:30 " " 14
" 10 " " 22

At 9 o'clock: Dec. 7
" 8:30 " " 15
" 8 " " 23

At 9:30 o'clock: November 30

NIGHT SKY: NOVEMBER AND DECEMBER.

Running westward from the zenith stretches the constellation of Andromeda, the chained lady who was rescued by Perseus. In this constellation may be seen a faint nebula which in a telescope is shown to cover an enormous extent, a great whirl of nebulous material. Probably it represents a star in the making. The great square of Pegasus lies just to the south of the zenith. The southern sky is filled by the constellation of Cetus, the Whale. The most interesting star in this group is that of Mira, which on the average of once in eleven months, blazes forth with a brilliance, sometimes exceeding the second magnitude. Generally, however, it does not exceed the third magnitude, while its normal brightness is such that it is barely visible to the naked eye. Between Cetus and the zenith are three small constellations, *i. e.*, Pisces, the Fishes, Aries, the Ram, and Triangulus, the Triangle. In the southeast sky is the wandering river, Eridanus, while the eastern sky is filled with brilliant winter constellations described in the paragraph on the January and February map.

THE SOUTHERN HEAVENS.

The accompanying map shows all the stars clearly visible to the naked eye within 60 degrees of the south pole. Only parts of this region may be seen from stations north of the Equator and even south of the Equator the entire region cannot be seen at one time, except from stations below the sixtieth latitude. To adjust the map so as to show just what southern stars are in sight, from any given station at any day and hour,

MAP OF THE SOUTHERN HEAVENS.

proceed as follows: Add to the time as given by the clock (if the clock gives standard time greater accuracy may be obtained by correcting it to give the local time) the quantity given in the accompanying table for the current month, and add to this sum, four minutes for each day of the date. The result will be Sidereal time.

	h.	m.
January	18	39
February	20	41
March	22	32
April	0	34
May	2	32
June	4	34
July	6	31
August	8	35
September	10	37
October	12	35
November	14	38
December	16	36

Midnight should be counted as 12 hours, 1 A.M. as 13 hours, and so on, and, if the sum exceeds 24 hours, this amount should be subtracted from it. For example, for 1:15 A.M. on October 25th, we have:

	h.	m.
Clock time	13	15
From table, for October	12	35
$4 \times 25 = 100$ minutes, or	1	40
Sum	27	30
Subtract 24 hours	24	0
Sidereal time	3	30

The results of this calculation will be correct within four or five minutes at the most, if the observer's clock keeps local time. If it keeps standard time, the result should be corrected by the amount by which standard time is fast or slow of local time. For our present purpose this correction is usually hardly necessary.

Find now the point on the margin of the map corresponding to the sidereal time. Turn the map until the corresponding time on the margin is at the top. Then lay a straight edge across the map so that it passes above the center at a distance equal to the observer's latitude, (if north of the Equator). As the white circles on the map are 10 degrees, 20 degrees, etc., from the center this can be done very easily. The part of the map above the straight edge then represents the southern sky as it appears above the observer's horizon. For stations south of the Equator, the straight edge should be held below the center of the map, at a distance equal to the latitude.

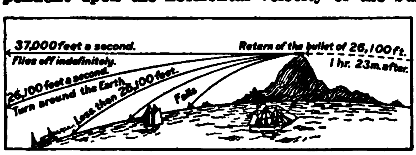
THE LARGE REFRACTORS OF THE WORLD.

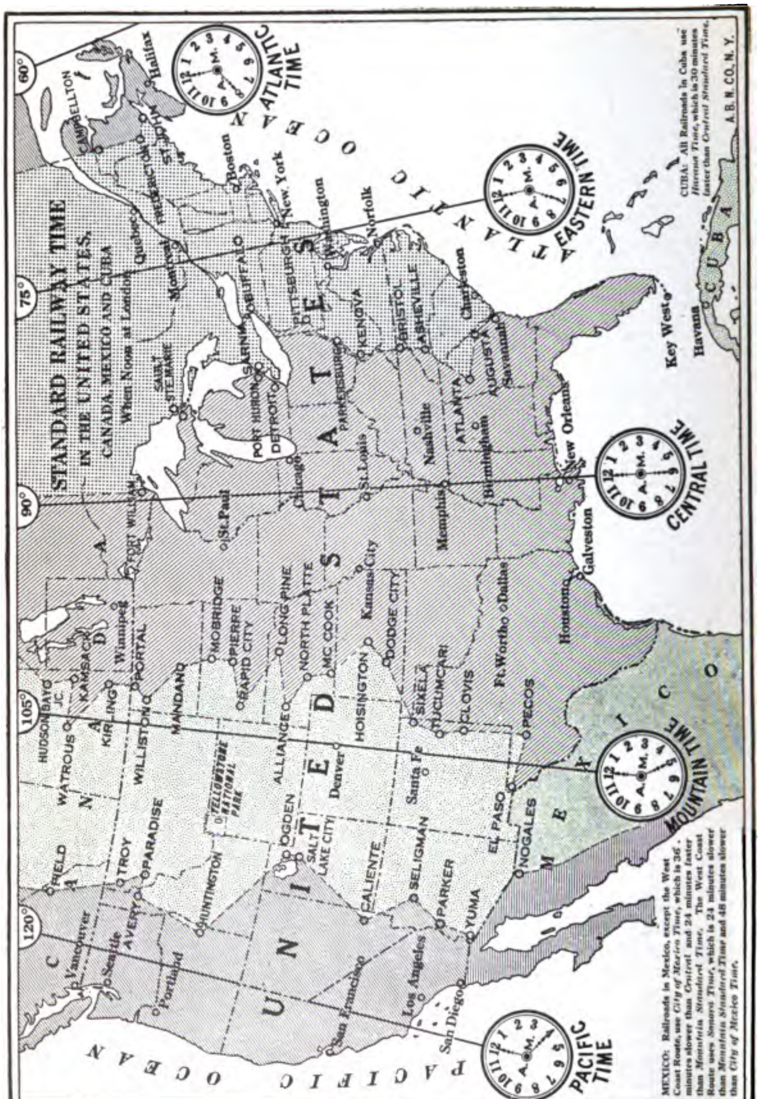
INSTITUTION.	Aperture in Inches.	Focal Length in Feet.	Date of Erection.
Yerkes Observatory, Wisconsin, U. S. A.	40.0	62.0	1897
Lick Observatory, California, U. S. A.	36.0	57.8	1888
National Observatory, Meudon, France	32.5	53.0	1891
Astrophysical Observatory, Potsdam, Germany	31.1	39.4	....
Bischoffsheim Observatory, Nice, France	30.3	52.6	1889
Imperial Observatory, Poulkova, Russia	30.0	42.0	1882
National Observatory, Paris, France	28.9	....	....
Royal Observatory, Greenwich, England	28.0	28.0	1894
Imperial Observatory, Vienna, Austria	27.0	34.0	1894
Royal Observatory, Greenwich, England	26.0	26.0	1897
Naval Observatory, Washington, U. S. A.	26.0	32.5	1871
Leander McCormick Observatory, Virginia, U. S. A.	26.0	32.5	1874
Cambridge University Observatory, England	25.0	....	1868
National University, Meudon, France	24.4	52.2	1891
Harvard College, Cambridge, U. S.A.	24.0	11.3	1894
Royal Observatory, Cape of Good Hope, Africa	24.0	22.6	1897
Lowell Observatory, Flagstaff, Arizona, U. S. A.	24.0	31.0	1895
National Observatory, Paris, France	23.6	59.0	1889
Halstead Observatory, Princeton, U. S. A.	23.0	32.0	1881
City Observatory, Edinburgh, Scotland	22.0	30.0	....
Etna, Italy	21.8	....	....
Buckingham Observatory, England	21.2	....	....
M. Porro, Private Observatory, Italy	20.5	....	....
Chamberlin Observatory, Colorado, U. S. A.	20.0	28.0	1891
Manila Observatory, Philippines	20.0	....	1892
Astrophysical Observatory, Potsdam, Germany	19.7	41.2	....
Imperial Observatory, Strassburg, Germany	19.1	23.0	1880
Milan Observatory, Italy	19.1	23.0	....
Dearborn Observatory, Illinois, U. S. A.	18.5	27.0	1863
National Observatory, La Plata, Argentina	18.1	29.5	1890
Lowell Observatory, Flagstaff, Arizona, U. S. A.	18.0	26.3	1894
Flower Observatory, Philadelphia, U. S. A.	18.0	....	1896
Royal Observatory, Cape of Good Hope, Africa	18.0	22.6	1897

—Knowledge Diary and Scientific Handbook.

SHOOTING A BULLET OFF THE EARTH.

When a bullet is fired from a horizontal gun, the curve of the path that it pursues is dependent upon the horizontal velocity of the bullet and gravity. The higher the horizontal velocity the flatter will be the curve and the further will the bullet travel before it strikes the earth. If the velocity of the bullet were 26,100 feet per second the curve of its path would be parallel to the circumference of the earth. Accordingly the bullet would pass around the earth without touching it, and return to its starting point in one hour and twenty-three minutes. It would continue to revolve about the earth as long as the velocity was maintained. At the same time it would be constantly attracted by the earth and would be forever falling away from a straight line towards the earth without ever reaching it. If the speed of the bullet were 37,000 feet per second it would fly off never to return to the earth.





ZONES OF STANDARD TIME IN THE UNITED STATES.

TIME.

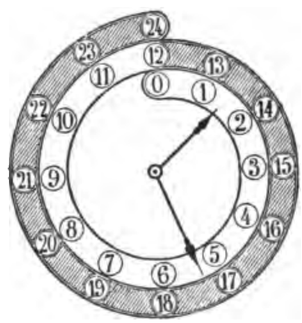
All calculations of time are based on the sun—not the real sun that we see, but a fictitious sun that keeps better time than the real sun. The time that is indicated by a sun dial is actual sun time or *Apparent Solar Time;* but this is not accurate enough for the civilized world because the day from noon to noon as marked by the real sun is longer at certain times of the year than at others. However, astronomers have constructed a fictitious sun that gives us days of uniform length, and the time it marks off is called *Mean Solar Time.* But this does not fully solve the problem of time. We have still to contend with the fact that the sun reaches the meridian successively later as it progresses westward, so that noon in Chicago, for instance, will be much later than noon in New York. In fact, noon on the west side of New York would come a few seconds later than noon on the east side. If each town in the country used local mean solar time, or *Local Time* as it is commonly called, the utmost confusion would prevail, particularly on railroads connecting the towns. To avoid this confusion it has been found necessary to establish certain zones in which uniform time is observed. It takes the sun twenty-four hours to circle the earth (to be sure it is the earth that moves, but for convenience we will consider that the earth is stationary and that the sun is moving around it). The earth is divided into 360 degrees of longitude. Therefore, it takes the sun one hour to traverse 15 degrees of longitude. The United States and the majority of the European countries have established time zones approximately 15 degrees wide, so that the time of one zone will differ from the next adjacent zones by an even hour. The degrees of longitude are measured from Greenwich, and at 15 degrees east of Greenwich the *Standard Time* used by the surrounding country will be just one hour ahead of *Greenwich Time.* Regions in the neighborhood 30 degrees east of Greenwich will use time two hours faster than the standard time of Greenwich. The same is true in the westward direction, except that here the clocks will be set slower than *Greenwich Time* in even hours at intervals of 15 degrees.

Eastern Time is taken from the 75th meridian, which being five times 15 degrees west of Greenwich, makes the time in this zone five hours slower than *Greenwich Time. Central Time* is taken from the 90th meridian and is one hour slower than *Eastern Time* and six hours slower than *Greenwich Time. Mountain Time* is taken from the 105th meridian, and *Pacific Time* from the 120th meridian. The zones are somewhat distorted, mainly to suit the convenience of railroads.

The movement which resulted in the adoption of the present time system may be said to have originated in a report on the subject by the American Meteorological Society which was submitted at a meeting of the General Time Convention held on October 13, 1881, proposing a single standard for the whole country and suggesting the hour theory as an alternative proposition. The proposal to fix one standard of time for the whole country had much to recommend it from a scientific point of view. But it was found to be impracticable on account of the many discrepancies which would occur between time by the clock and solar time. Accordingly the hour system was adopted at a meeting of the Convention held in April, 1883. At noon, on November 8, 1883, time signals were sent out from Washington in accordance with the new hour standard time.

In Europe each country is small enough to be included in a single zone. *Greenwich Time* is used in Belgium, France, Great Britain, Holland (railways and telegraph), Portugal, and Spain. *Central European Time,* which is one hour faster than *Greenwich Time,* is used by Austria-Hungary, Denmark, Germany, Italy, Norway, Servia, Sweden and Switzerland. *Eastern European Time,* two hours faster than *Greenwich,* is used by Bulgaria and Egypt, and, by Europeans, in Turkey, the native time in the last-named country being based on sunset, which being the end of the Turkish day, marks the hour of 12.

In Belgium, France, Italy and Spain railroad clock dials are divided into twenty-four hours, beginning with 0 at midnight and thus doing away with A. M. and P. M. In France and Portugal, clocks on the exterior of railroad stations are true, while those within are set five minutes slow.



TWENTY-FOUR AND TWELVE HOUR TIME COMPARED.

Were it possible for a person to travel westward around the world as fast as the sun, time would to him appear to be at a standstill. If he started, say at noon Monday, it would always be noon Monday to him, and apparently there would be no change in his calendar. Yet somewhere along his course around the world Monday must have ended and Tuesday must have begun. Were the traveler proceeding eastward he would in 12 hours meet and pass the sun on the opposite side of the earth and would apparently have reached the hour of noon Tuesday. At the end of 12 hours more he would meet the sun a second time and would have to tear off another leaf from his calendar and call the time noon, Wednesday. In other words, his journey around the globe would have taken him two days longer than the man who traveled with the sun and made the trip in no time. It is a fact that a trip around the earth in a west-

ward direction can actually be made in two days less than a trip in the eastward direction, although the same rate of speed is preserved; but the days of the east-bound traveler would be shorter than those of the west-bound traveler. In both cases the travelers would arrive with their calendars one day wrong; but a line has been established running north and south at which travelers are obliged to add a day if they cross it going westward or subtract a day if they cross it traveling eastward. In other words, the day is supposed to start and end along this line, which is called the *International Date Line.* It follows the 180th meridian except for a few digressions, as indicated in the map on the opposite page, to suit the convenience of inhabitants of islands lying nearby.

TABLE FOR THE CONVERSION OF TIME.

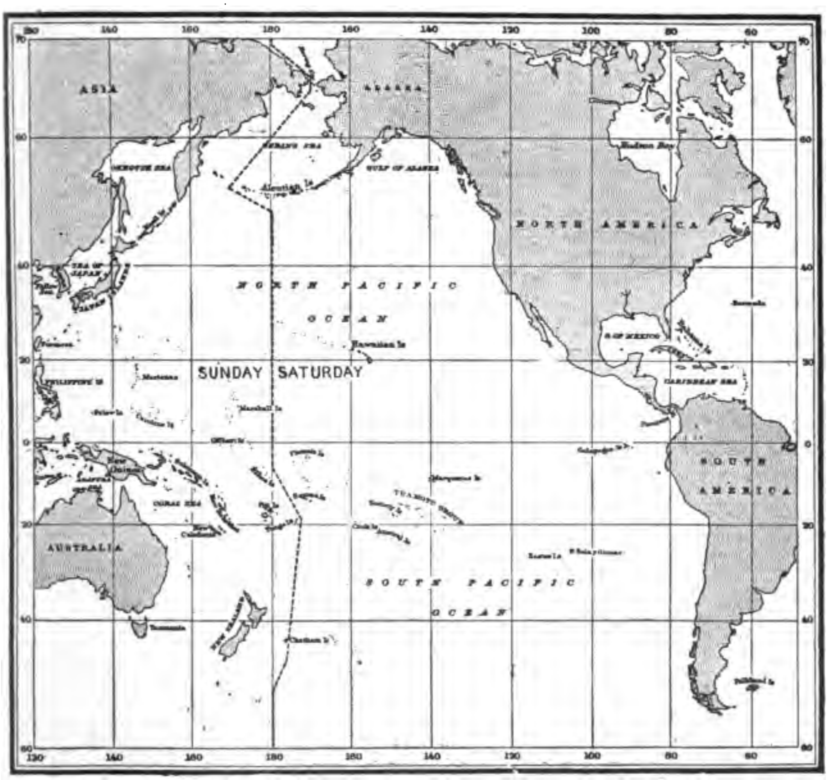
(To the nearest second.)

PLACE.	Earlier (−) or Later (+) than, East'n Stand'd.			Greenwich.		
	h	m	s	h	m	s
United States—						
From Maine to South Carolina	0	0	0	−5	0	0
From Dakota and Michigan to Texas and Florida	−1	0	0	−6	0	0
From Montana to Arizona and New Mexico	−2	0	0	−7	0	0
Pacific Coast States and Nevada	−3	0	0	−8	0	0
Sitka, Alaska	−4	0	0	−9	0	0
Hawaiian Islands	−5	30	0	−10	30	0
Tutuila, Samoa	−6	30	0	−11	30	0
Guam	+14	30	0	+9	30	0
Philippine Islands	+13	0	0	+8	0	0
Porto Rico	+1	0	0	−4	0	0
Panama Canal Zone	0	0	0	−5	0	0
Algeria	+5	9	21	+0	9	21
Argentina	+0	43	12	−4	16	48
Australia, western	+13	0	0	+8	0	0
Australia, central	+14	30	0	+9	30	0
Australia, eastern	+15	0	0	+10	0	0
Austria-Hungary	+6	0	0	+1	0	0
Belgium	+5	0	0	0	0	0
Borneo (British North) and Labuan	+13	0	0	+8	0	0
Brazil (Rio Janeiro)	+2	7	19	−2	52	41
British Columbia	−3	0	0	−8	0	0
Canada, eastern	0	0	0	−5	0	0
Canada, central	−1	0	0	+6	0	0
Chile	+0	17	14	−4	42	46
China (Shanghai)	+13	5	43	+8	5	43
China (Saigon)	+12	6	49	+7	6	49
Colombia	+0	3	6	−4	56	54
Costa Rica	−0	36	17	−5	36	17
Cuba	−0	29	26	−5	29	26
Denmark	+6	0	0	+1	0	0
Ecuador	−0	14	7	−5	14	7
Egypt	+7	0	0	+2	0	0
England	+5	0	0	0	0	0
Fiji Islands (Suva)	+16	53	44	+11	53	44
France	+5	0	0	+0	0	0
Germany	+6	0	0	+1	0	0
Gibraltar	+5	0	0	0	0	0
Greece	+6	34	53	+1	34	53
Holland	+5	0	0	0	0	0
Honduras	−1	0	0	−6	0	0
Hongkong	+13	0	0	+8	0	0
India (Madras)	+10	30	00	+5	30	00
Ireland	+4	34	39	−0	25	21
Italy	+6	0	0	+1	0	0
Jamaica (Kingston)	−0	7	11	−5	7	11
Japan	+14	0	0	+9	0	0
Java	+12	7	14	+7	7	14
Kiaochau	+13	0	0	+8	0	0
Korea	+14	0	0	+9	0	0
Madagascar (Tananarivo)	+8	10	7	+3	10	7
Malta	+6	0	0	+1	0	0
Mauritius	+8	50	13	+3	50	13
Mexico	−1	36	27	−6	36	27
Newfoundland (St. Johns)	+1	29	16	−3	30	44
New Zealand	+16	30	0	+11	30	0
Nicaragua	−0	45	10	−5	45	10
Norway	+6	0	0	+1	0	0

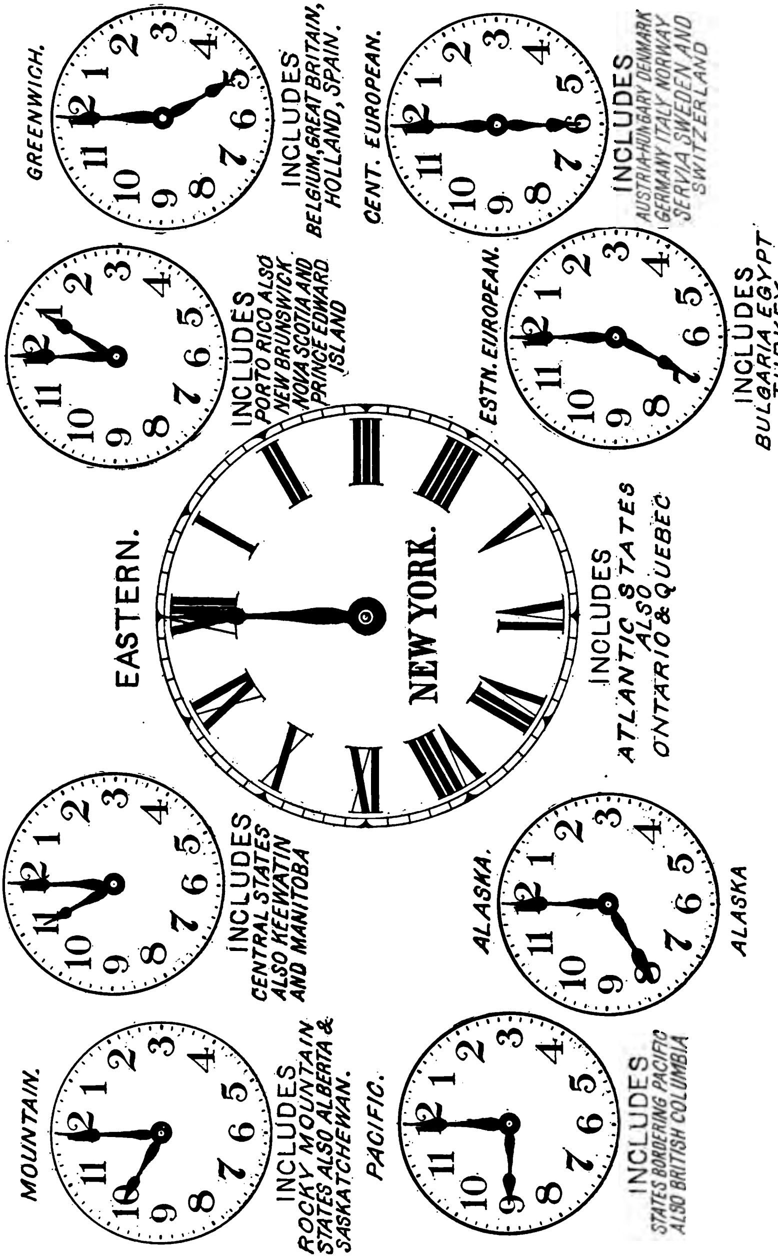
TABLE FOR THE CONVERSION OF TIME—*Continued.*

(To the nearest second.)

PLACE.	Earlier (−) or Later (+) than, East'n Stand'd.			Greenwich.		
Nova Scotia	+1	0	0	−4	0	0
Panama (Colon)	−0	19	39	−5	19	39
Peru	−0	9	3	−5	9	3
Portugal	+5	0	0	0	0	0
Russia (Pulkowa)	+7	1	19	+2	1	19
Russia (Irkutsk)	+11	57	5	+6	57	5
Russia (Vladivostok)	+13	47	31	+8	47	31
Salvador	−0	56	32	−5	56	32
Servia	+6	0	0	+1	0	0
Singapore	+11	55	25	+6	55	25
South Africa (British)	+7	0	0	+2	0	0
Spain	+5	0	0	0	0	0
Sweden	+4	0	0	+1	0	0
Switzerland	+6	0	0	+1	0	0
Tunis	+5	9	21	+0	9	21
Turkey	+7	0	0	+2	0	0
Uruguay	+1	15	11	−3	44	49
Venezuela	+0	32	16	−4	27	44



MAP SHOWING INTERNATIONAL DATE LINE



The small dials show what time it is in those states and countries of America and Europe that use Standard Greenwich time, when it is 12 o'clock in New York. France and Portugal have just adopted Greenwich time.

The Simplex Perpetual Calendar.

Giving the days of the week of any month of any year of the Christian Era, and also the Dominical Letters in either the Julian (Old Style) or Gregorian (New Style) Calendar. Arranged by JOHN C. ROBERTSON, Kirkcaldy.

Table of Hundreds. Julian.	Table of Hundreds. Gregorian.	00 Julian.	00 Gregorian.	01 29 57 85	02 30 58 86	03 31 59 87	04 32 60 88	05 33 61 89	06 34 62 90	07 35 63 91	08 36 64 92	09 37 65 93	10 38 66 94	11 39 67 95	12 40 68 96	13 41 69 97	14 42 70 98	15 43 71 99	16 44 72	17 45 73	18 46 74	19 47 75	20 48 76	21 49 77	22 50 78	23 51 79	24 52 80	25 53 81	26 54 82	27 55 83	28 56 84
0 7 14 21	17 21 25	**5**	5	6	0	1	**3**	4	5	6	**1**	2	3	4	**6**	0	1	2	**4**	5	6	0	**2**	3	4	5	**0**	1	2	3	**5**
1 8 15 22		**4**		5	6	0	**2**	3	4	5	**0**	1	2	3	**5**	6	0	1	**3**	4	5	6	**1**	2	3	4	**6**	0	1	2	**4**
2 9 16 23	18 22 26	**3**	3	4	5	6	**1**	2	3	4	**6**	0	1	2	**4**	5	6	0	**2**	3	4	5	**0**	1	2	3	**5**	6	0	1	**3**
3 10 17 24		**2**		3	4	5	**0**	1	2	3	**5**	6	0	1	**3**	4	5	6	**1**	2	3	4	**6**	0	1	2	**4**	5	6	0	**2**
4 11 18 25	15 19 23 27	**1**	1	2	3	4	**6**	0	1	2	**4**	5	6	0	**2**	3	4	5	**0**	1	2	3	**5**	6	0	1	**3**	4	5	6	**1**
5 12 19 26	16 20 24 28	**0**	0	1	2	3	**5**	6	0	1	**3**	4	5	6	**1**	2	3	4	**6**	0	1	2	**4**	5	6	0	**2**	3	4	5	**0**
6 13 20 27		**6**		0	1	2	**4**	5	6	0	**2**	3	4	5	**0**	1	2	3	**5**	6	0	1	**3**	4	5	6	**1**	2	3	4	**6**

Dominical Letters.
Julian or Gregorian.

0	1	2	3	4	5	6	0
A	G	F	E	D	C	B	A

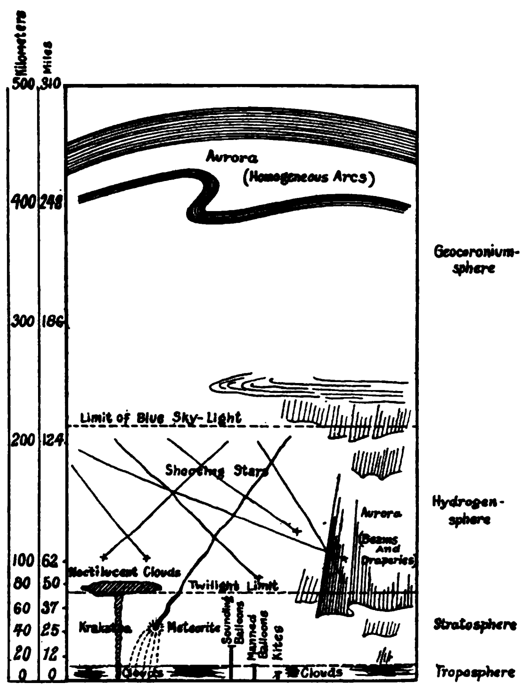
The factor for the year indicates its Letter, but the preceding Letter applies to January and February of Leap Years.

Find in the Table-of-Hundreds the first figure, or figures, of the number of the given year in either the Julian or Gregorian section as required. Next find in the Table-of-Tens-and-Units the last figures. Then find the factor for the year in line with its first and under its last figures. The sum of the factors for the year and the month indicates the required Monthly Table. Factors in heavy type indicate Leap-Years.

Days.	Factors for the Months.		Factors for Leap-Years =
31	Jan.	0	6
28/29	Feb.	3	2
31	Mar.	3	
30	April	6	
31	May	1	
30	June	4	
31	July	6	
31	Aug.	2	
30	Sept.	5	
31	Oct.	0	
30	Nov.	3	
31	Dec.	5	

Monthly Tables.

No. 0 or 7.	No. 1 or 8.	No. 2 or 9.	No. 3 or 10.	No. 4 or 11.	No. 5 or 12.	No. 6.
S 1 8 15 22 29	S .. 7 14 21 28	S .. 6 13 20 27	S .. 5 12 19 26	S .. 4 11 18 25	S .. 3 10 17 24 31	S .. 2 9 16 23 30
M 2 9 16 23 30	M 1 8 15 22 29	M .. 7 14 21 28	M .. 6 13 20 27	M .. 5 12 19 26	M .. 4 11 18 25 ..	M .. 3 10 17 24 31
Tu 3 10 17 24 31	Tu 2 9 16 23 30	Tu 1 8 15 22 29	Tu .. 7 14 21 28	Tu .. 6 13 20 27	Tu .. 5 12 19 26 ..	Tu .. 4 11 18 25 ..
W 4 11 18 25 ..	W 3 10 17 24 31	W 2 9 16 23 30	W 1 8 15 22 29	W .. 7 14 21 28	W .. 6 13 20 27 ..	W .. 5 12 19 26 ..
Th 5 12 19 26 ..	Th 4 11 18 25 ..	Th 3 10 17 24 31	Th 2 9 16 23 30	Th 1 8 15 22 29	Th .. 7 14 21 28 ..	Th .. 6 13 20 27 ..
F 6 13 20 27 ..	F 5 12 19 26 ..	F 4 11 18 25 ..	F 3 10 17 24 31	F 2 9 16 23 30	F 1 8 15 22 29 ..	F .. 7 14 21 28 ..
S 7 14 21 28 ..	S 6 13 20 27 ..	S 5 12 19 26 ..	S 4 11 18 25 ..	S 3 10 17 24 31	S 2 9 16 23 30 ..	S 1 8 15 22 29 ..



WEGENER'S "PROFILE OF THE ATMOSPHERE."

The lowest dotted line (about 7 miles above the ground) is "where the air stops growing colder." It is the upper limit of ordinary clouds, of storms, and of balloon ascensions by human beings. Nearly all the moisture of the atmosphere lies below this level. Above this line comes the second layer of the atmosphere, the stratosphere (also called the "isothermal layer," because a thermometer carried up through it would show little change of temperature with change of elevation). This layer has been penetrated by sounding-balloons, carrying meteorological apparatus but no human aeronaut, as far as 20 miles above the earth. At about 50 miles—the upper limit of twilight—begins a region in which the atmosphere consists chiefly of hydrogen. Near the lower border of this region clouds of fine dust have sometimes been observed, shining by reflected sunlight on summer nights. These "noctilucent clouds" are commonly explained as the product of volcanic eruptions on the earth (they were frequently seen after the eruption of Krakatoa), but may be of cosmical origin.

Concerning the uppermost regions of the atmosphere we have little positive knowledge. Above about 130 miles from the earth, Dr. Alfred Wegener, the author of this diagram, believes that a gas ("geocoronium"), much lighter than hydrogen prevails, to which he attributes the characteristic green line in the spectrum of the higher auroras. This is hardly more than a guess at present.

CHAPTER III.

METEOROLOGY.*

By C. Fitzhugh Talman.

COMPOSITION, PRESSURE AND HEIGHT OF THE ATMOSPHERE.

Up to a height of eight or ten miles above the earth the composition of the atmosphere is remarkably uniform, as to its principal constituents. *Pure dry air* is a mixture (not a chemical compound) of gases in the following proportions, by volume: Nitrogen, 78.03%; oxygen, 20.99%; argon, 0.94%; carbon dioxide, 0.03%; hydrogen, 0.01%; together with minute quantities of neon, krypton, xenon, helium, and possibly other gases. At the levels habitable by man the air always contains invisible water vapor (from a small trace to about 5%), and usually small and variable amounts of ozone, ammonia, nitric acid, and other gases, which, on account of their irregular occurrence, are not classed among the normal constituents of the atmosphere. Lastly, the lower air always contains solid impurities, in endless variety, generically known as *dust*.

The *pressure of the air* at sea-level averages about 14.7 pounds to the square inch, which corresponds to a reading of 29.92 inches of the barometer. The density and the pressure of the air decrease rapidly as we ascend. At an altitude of 3.6 miles above sea-level they are reduced one-half; i. e., half the whole mass of the atmosphere lies below this elevation; yet the atmosphere extends at least 300 miles above the earth. At great altitudes the tenuity of the atmosphere is comparable to that of the best "vacuums" attainable in the laboratory.

THE UPPER ATMOSPHERE.

The investigation of the upper atmosphere, which has been prosecuted most actively since the beginning of the twentieth century, constitutes a special branch of research known as *aerology*. It has made meteorology a "science of three dimensions."

The atmosphere is "sounded" by means of meteorological instruments attached to kites and balloons. The greatest height ever attained by a kite was 4.51 miles above sea-level, at Mount Weather, Va., May 5, 1910; by a balloon, 20.14 miles, at Uccle, Belgium, June 9, 1911. Above the levels attainable by these means, the atmosphere is studied by observations of the aurora, meteor trains, and optical phenomena, and by computation of the distribution of the atmospheric gases, as determined by their atomic weights.

Since the year 1902 it has been known that the atmosphere is divided into at least two layers, or shells, having quite different properties. If we could travel in a balloon to the top of the atmosphere we should find the air rapidly growing colder as we ascended, until, at a height of about 7 miles, this fall in temperature suddenly ceased, as we entered the *isothermal layer*, or *stratosphere*. The air below this level—the *troposphere*—contains practically all the moisture of the atmosphere; hence all clouds (except possibly dust clouds of volcanic or cosmical origin). All storms, also, are confined to the troposphere.

During our ascent through the stratosphere we should find ourselves in a region of comparatively gentle winds and of uniform temperature in a vertical direction. We should find the atmosphere gradually ceasing to be "air," and becoming mainly nitrogen. Later we should reach a region in which nitrogen was replaced by the lighter gas hydrogen.

Possibly a gas even lighter than hydrogen exists in the atmosphere, and if so it must be most abundant at the highest levels. Its existence is conjectured on the evidence of the spectrum of a certain type of aurora,

and it has been named provisionally "geocoronium."

Wegener's profile of the atmosphere represents these facts graphically.[1]

THE METEOROLOGICAL ELEMENTS AND INSTRUMENTS.

The *temperature of the air* is measured with the *thermometer*, or continuously with the *thermograph*. Extremes of temperature are automatically recorded with the *maximum* and the *minimum thermometer*. The temperature underground is measured with the *soil thermometer*.

The total *solar radiation* or *insolation* is measured with the *actinometer* or the *pyrheliometer*. The intensity of the shorter wave-lengths, including the ultra-violet, is measured with several forms of *photometer*. The distribution of energy throughout the solar spectrum is measured with Langley's *bolometer*. The *duration of sunshine* is measured with the *sunshine-recorder*.

The *pressure of the air* is measured with the *barometer* (mercurial or aneroid), or continuously with the *barograph*. Minute fluctuations of pressure are measured with the *statoscope*, the *microbarograph*, the *pressure-variometer*, or the *variograph*. Altitude, as affecting barometric pressure, is measured with the *hypsometer*.

The *humidity of the air* (relative or absolute) is measured with the *hygrometer* or the *psychrometer;* or continuously with the *hygrograph*.

The *rainfall* is measured with the *rain-gage*—probably the oldest of meteorological instruments. Rain-gages were used in India in the 4th century B.C. The *self-recording rain-gage* makes a continuous record of the amount of rainfall; the *ombroscope* of its duration only, including the lightest showers. *Snowfall* is usually measured as rainfall; i. e., the observer melts the snow before measuring it, or else computes its "water equivalent." There are, however, *snow-gages* of various forms. The *drosometer*, for measuring dew, is little used.

[1]Wegener's "geocoroniumsphere" is still a matter of speculation, but has attained considerable prominence in the current literature of meteorology. His "hydrogensphere" is, in current terminology, usually included in the stratosphere.

Evaporation is measured with the *atmometer* (*atmidometer*, *evaporimeter*); continuously with the *atmograph*.

The *direction of the wind* is observed with the *wind-vane*, which may be arranged to make a continuous record. The *velocity* or the *force of the wind* is measured with the *anemometer* (continuously with the *anemograph*), or estimated by the observer in terms of a simple wind-scale. (See Beaufort Scale at the end of the chapter.) The vertical component of the wind is measured with the *vertical anemometer*.

The *state of the weather*, as clear, partly cloudy, cloudy, raining, foggy, etc., is observed non-instrumentally. The *degree of cloudiness* is the number of tenths of the sky covered with clouds, from 0 = cloudless to 10 = completely overcast. Exact measurements of cloudiness may be made with Besson's *nephometer*. The duration of cloudiness at night is sometimes measured with the *pole-star recorder*.

Clouds are observed as to their form, and as to direction and speed of movement, as measured with the *nephoscope*. Photographic measurements of clouds are made with the *photonephograph*.

The normal electrical phenomena of the atmosphere include the *vertical potential gradient*, measured with *collectors* and *electrometers* (some self-recording); also *ionization* and its effects, observed with *dissipation-apparatus*, *conductivity-apparatus*, *ion-counters*, etc.

Lightning flashes set up Hertzian waves (known to wireless operators as "atmospherics," "strays," "statics," "X's," etc.) and these are recorded at a distance by the *ceraunograph*, or *thunderstorm-recorder*, or audibly in the *ceraunophone*.

Aerological observations, now forming part of the routine of many observatories, have been referred to in the preceding section. The apparatus employed includes the *kite* and the *kite-reel* (usually a power-driven winch); the *captive balloon*; the *pilot-balloon* (sent aloft without attached instruments, merely for observing the drift of the upper air, and usually followed with a theodolite); the *sounding-balloon* (which bursts at a great altitude, and is wafted gently to the ground, with its attached instruments, by a parachute

or an auxiliary balloon); the *inflating-balance*, for securing the proper ascensional force of balloons; and special light forms of *meteorograph*, which are attached to kites and balloons and continuously record the temperature, pressure, humidity, etc., during a flight.

Various accidental constituents of the atmosphere are measured at certain observatories; especially *ozone*, with the *ozonometer*, and *dust*, with the *dust-counter*, the *koniscope*, or the *aeroscope*.

The *periodical phenomena of animals and plants* form a most valuable gage of weather and climate. Their observation constitutes a borderland between meteorology and biology, known as *phenology*.

METEOROLOGICAL INSTRUMENTS. (Pages 488-497.)

I. Temperature and Radiation.

1. Maximum and minimum thermometers. 2. Thermograph. 3. Thermometer screen. 4. Earth thermometer (section). 5. "Black bulb in vacuo." 6. Pyrheliometer (Marvin). 7. Thermometric sunshine recorder (Marvin). 8. Photographic sunshine recorder (Jordan). 9. Burning-glass sunshine recorder (Campbell-Stokes). 10. Terrestrial radiation thermometer.

II. Atmospheric Pressure.

11. Mercurial barometer (Fortin type). 12. Aneroid barometer. 13. Statoscope. 14. Barograph. 15. Microbarograph (Shaw-Dines). 16. Pressure-variometer (Bestelmeyer).

Nos. 13 and 16 are for aeronautical use.

III. Humidity.

17. Aspiration psychrometer (Assmann). 18. Hair hygrometer. 19. Psychrometer. 20. Polymeter (Lambrecht). 21. Whirl psychrometer.

IV. Precipitation.

22. Tipping-bucket rain-gage. 23. Tube, density bucket, and scale for weighing samples of snow (Marvin). 24. Rain-gage and measuring-glass (Snowdon pattern). 25. Details of standard rain-gage (U. S. Weather Bureau). 26. Vertical snow scale (Marvin).

V. Evaporation.

27. Evaporation-pan and still-well (Marvin). 28. Evaporimeter (Piche). 29. Porous cup atmometer (Livingston). 30. Balance-evaporimeter (Wild). 31. Atmograph (Houdaille).

VI. Wind.

32 and 33. Pressure-tube anemometer (Dines). 34. Arrow wind-vane, Robinson anemometer, and support (U. S. Weather Bureau patterns). 35. (To the left) Lind's pressure-anemometer. (To the right) Windmill vane of the anemocinemograph (Richard). 36. Pressure-plate anemometer (Fuess). 37. Pendulum anemometer. 38. Recording dial of No. 36. 39. Photographic vertical anemometer (Ludewig). 40. Vertical anemometer (Wiechert).

Nos. 39 and 40 are chiefly of aeronautical use.

VII. Clouds.

41. Reflecting nephoscope (Fineman). 42. Nephometer (Besson). 43. Direct-vision nephoscope (Besson). 44. Reflecting nephoscope (Marvin).

VIII. Atmospheric Electricty.

45. Self-registering electrometer (Benndorf). 46. Dissipation apparatus (Elster & Geitel). 47. Conductivity apparatus (Gerdien). 48. Ceraunograph, or thunderstorm recorder, combined with a barograph (Turpain).

IX. Aerology.

49-52. Meteorographs for kites and balloons (49, German; 50, U. S.; 51, French; 52, English). 53. Balloon theodolite. 54. Inflating balance. 55. Meteorological kite.

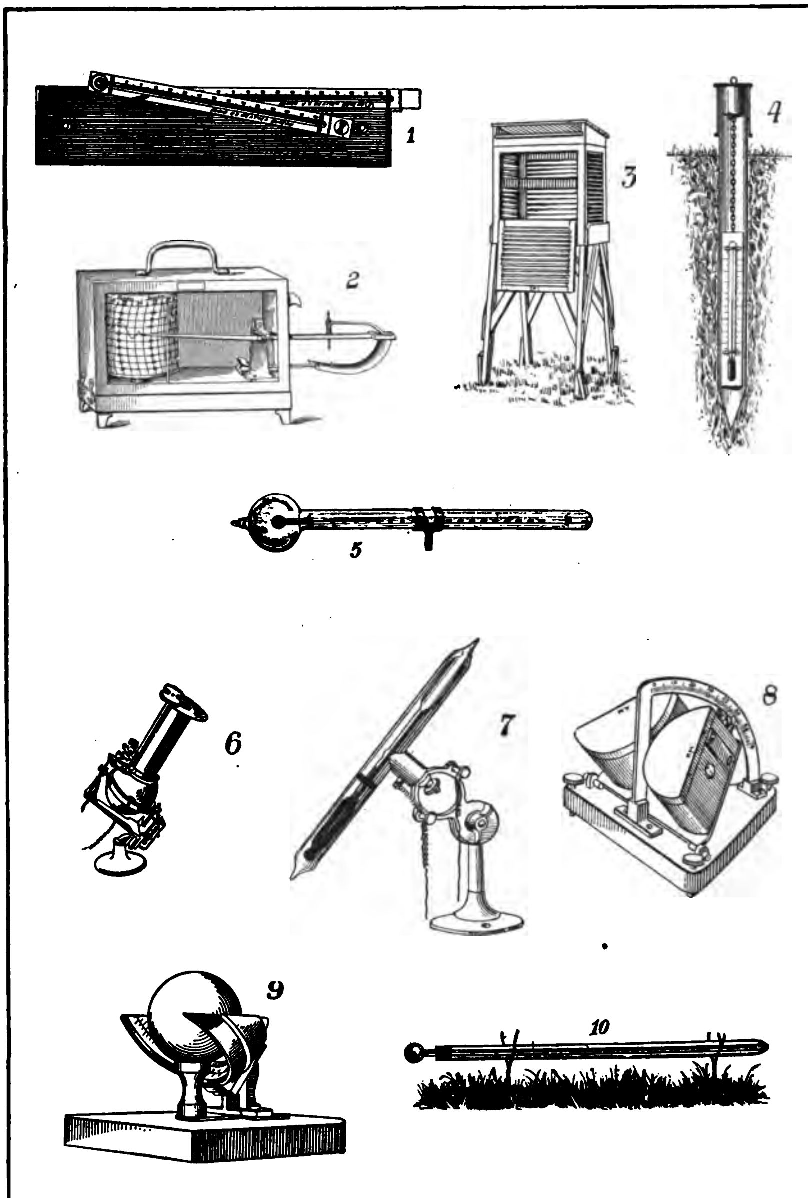
X. Miscellaneous.

56. Meteorograph, or electrical recording apparatus for wind-vane, anemometer, rain-gage, and sunshine recorder (U. S. Weather Bureau pattern). 57. Dust-counter (Aitken). 58. Aeroscope (Miquel).

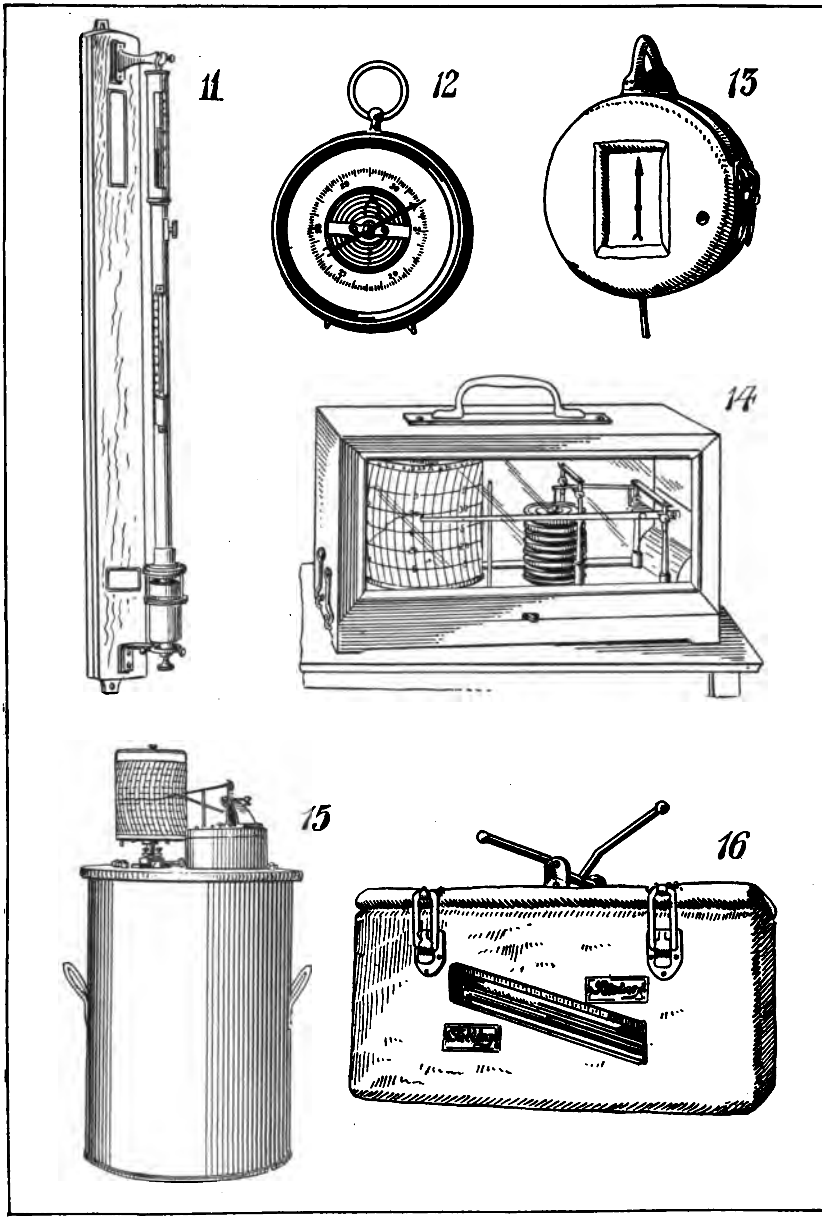
The foregoing list of the meteorological elements and instruments is by no means exhaustive.

HEATING AND COOLING OF THE ATMOSPHERE.

The amount of heat received by the atmosphere from the moon, the planets and the stars is infinitesimal, and these bodies have no influence whatever on terrestrial weather and climate. The atmosphere is very slightly warmed by the internal heat of the earth; its mean temperature is probably raised less than three-tenths of a degree Fahrenheit by this agency—a negligible amount.



METEOROLOGICAL INSTRUMENTS. I. TEMPERATURE AND RADIATION



METEOROLOGICAL INSTRUMENTS. II. ATMOSPHERIC PRESSURE.

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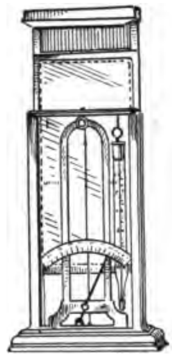

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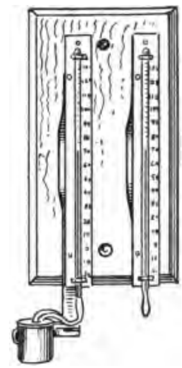

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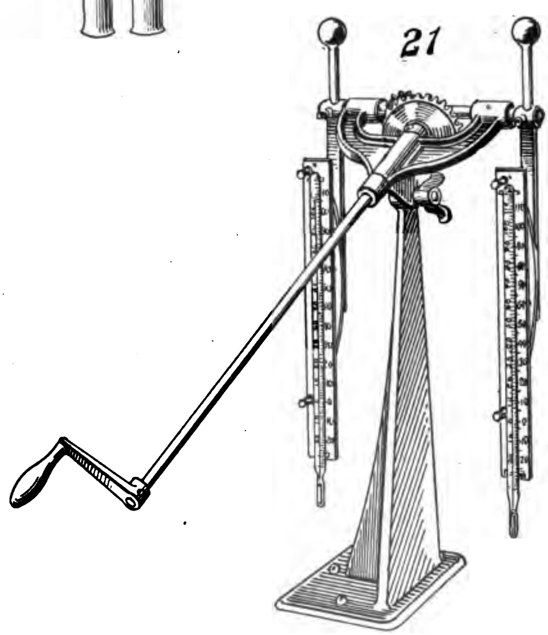

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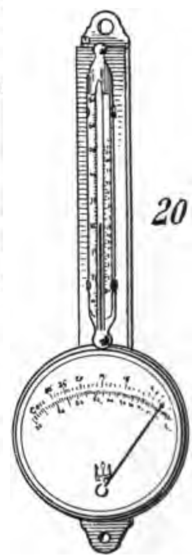

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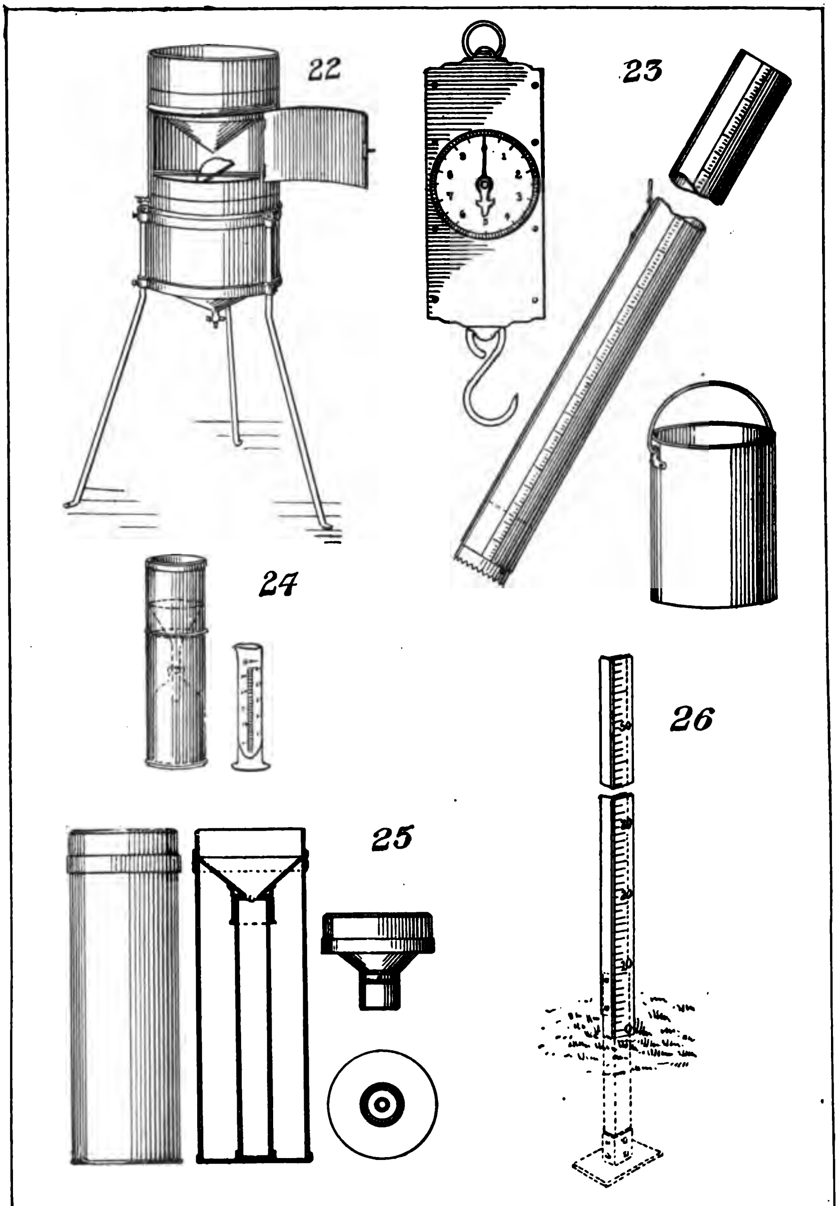
METEOROLOGICAL INSTRUMENTS. III. HUMIDITY.



METEOROLOGICAL INSTRUMENTS. IV. PRECIPITATION.

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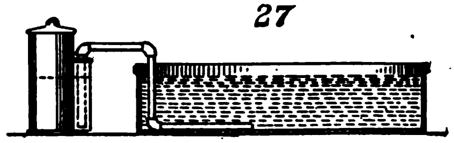

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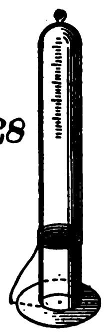

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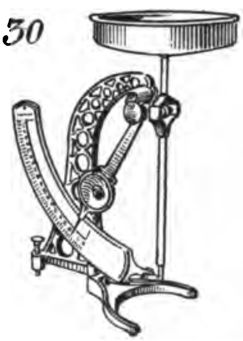

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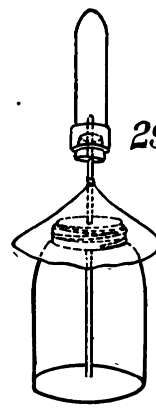

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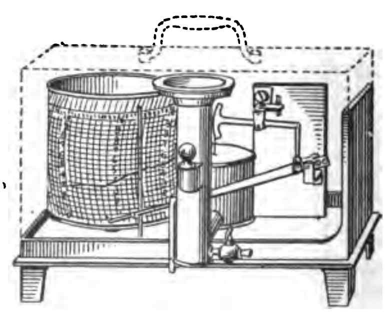
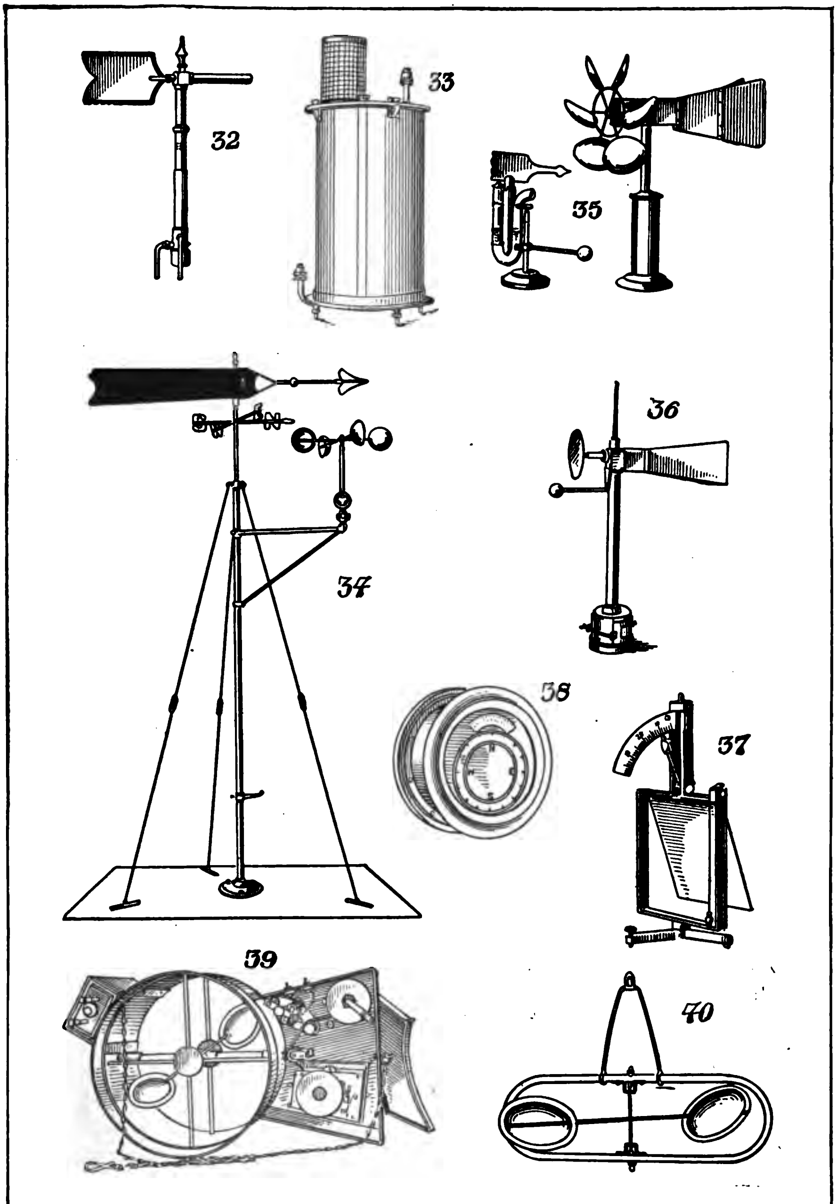
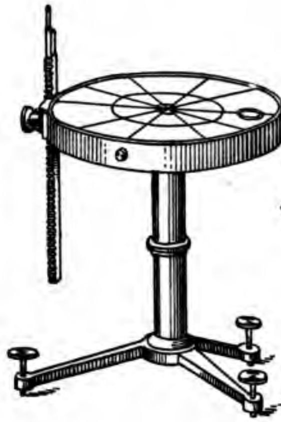


METEOROLOGICAL INSTRUMENTS. V. EVAPORATION.



METEOROLOGICAL INSTRUMENTS. VI. WIND.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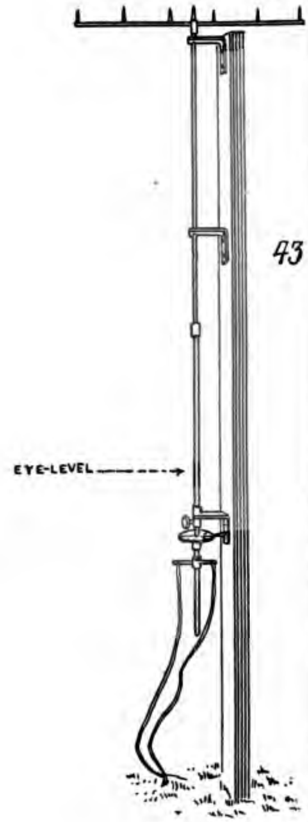

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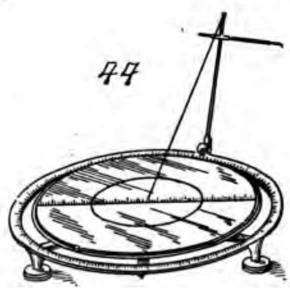
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METEOROLOGICAL INSTRUMENTS. VII. CLOUDS.

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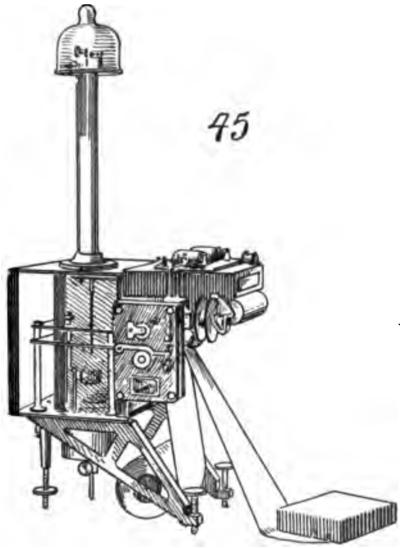

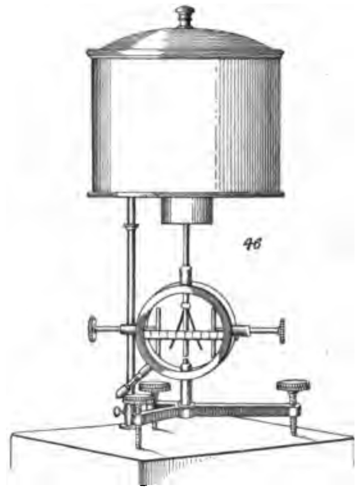

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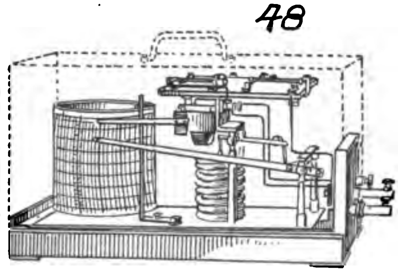

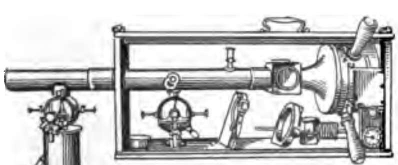

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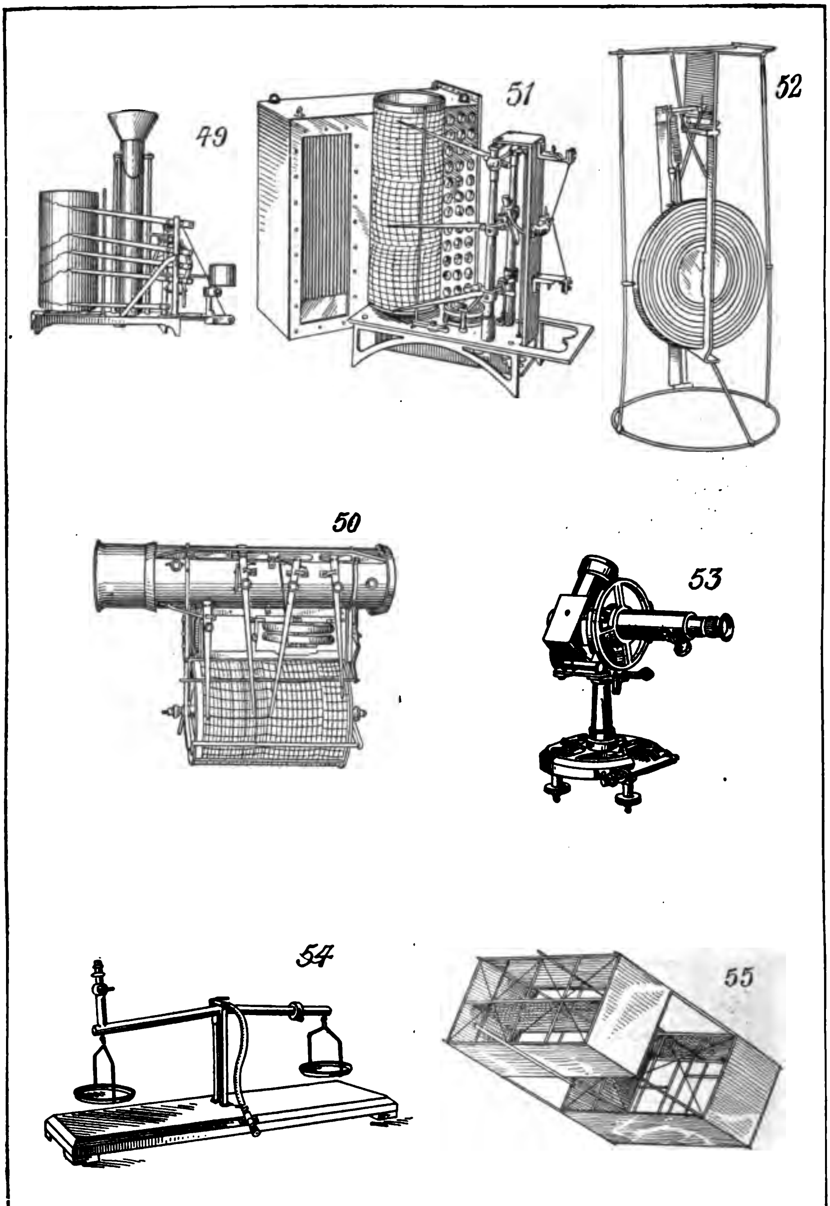
METEOROLOGICAL INSTRUMENTS. VIII. ATMOSPHERIC ELECTRICITY.



METEOROLOGICAL INSTRUMENTS. IX. AEROLOGY.

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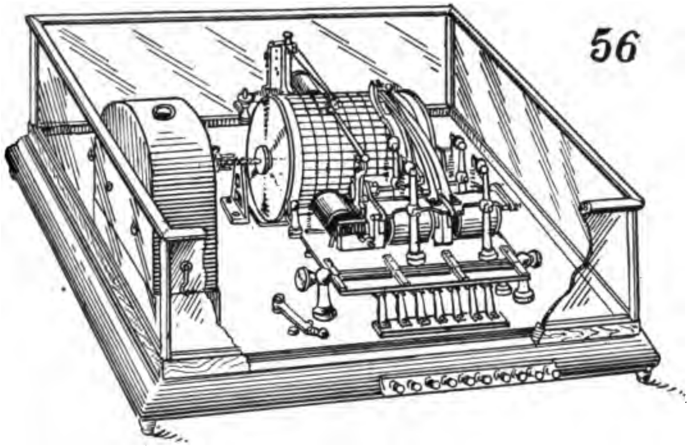

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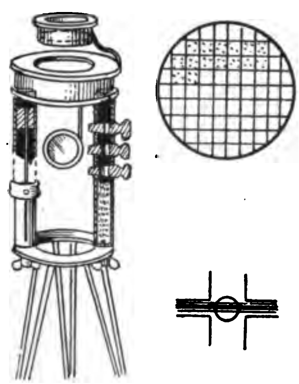

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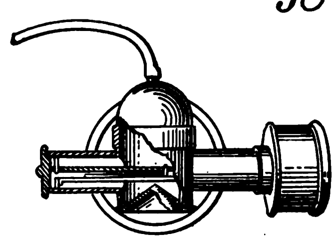


METEOROLOGICAL INSTRUMENTS. X. MISCELLANEOUS.

KITE FLYING FROM A MOVING BOAT ON LAKE CONSTANCE.

The *sun* is the one great source from which the atmosphere is heated. At its outer limit the atmosphere receives vertically from the sun, on an average, 1.92 calories of heat per square centimeter per minute (Abbot, Proc. Amer. Phil. Soc., 1911). This datum is known as the *solar constant* —a misnomer, as the actual amount fluctuates by several per cent; i. e., the sun is not actually a constant source of heat.

The atmosphere is mainly heated from below, although the heat originally comes from above. This paradox is explained by the fact that but a small part of the solar heat is absorbed by the atmosphere when passing through it on its way to the earth. Several processes are involved in the disposal of solar heat (more accurately, radiation) by the earth and its atmosphere, and different wave-lengths undergo different effects. This complex subject, involving the study of solar radiation with the aid of the pyrheliometer, bolometer, photometer, polarimeter, etc., forms a border science between meteorology and solar physics, with important applications to biology. It is engaging the attention of a numerous body of investigators, but has not yet received a distinct name.

For the present purpose it may be stated that the earth, heated by the sun's rays, imparts its heat by conduction to a shallow layer of air immediately above it. Conversely, portions of the earth's surface withdrawn from the sun's rays lose their heat by radiation into space, and the air adjacent to them is cooled by conduction. Inequalities of temperature plus the force of gravity set up air currents, which distribute heat through the atmosphere. The latter process is called *convection.* As between a land surface and a water surface, the former undergoes much wider fluctuations of temperature from day to night, and from summer to winter, causing correspondingly wider fluctuations in the temperature of the overlying atmosphere. Hence a continental climate is much less equable than a marine climate. Lastly, rising and falling air-masses are *adiabatically* cooled and heated, respectively, at the rate of 1.6° Fahrenheit per 300 feet of vertical motion. (The cooling process is less rapid than this when condensation of moisture is in progress.)

DISTRIBUTION OF TEMPERATURE.

The earth revolves around the sun, and its axis, which always remains parallel to itself, is inclined to the plane of its orbit. These facts explain the march of the seasons and their opposition in the two hemispheres. The amount of heat (insolation) received at any place at a given moment depends chiefly upon the altitude of the sun. The aggregate amount received at any period of the year depends also upon the length of the day, which varies with latitude, except at the equinoxes. At the summer solstice, the north pole, where the day is then 24 hours long, actually receives a greater daily amount of insolation than any other part of the globe; but this is ineffective in raising the temperature on account of the long oblique path of the solar rays through the atmosphere, and the large amount of snow and ice that must be melted before the overlying air can be warmed. At the winter solstice a still greater amount of insolation is received at the south pole, as the earth is then in perihelion.

If the earth had a smooth homogeneous surface and no atmosphere the horizontal distribution of temperature at any time would depend entirely upon latitude. The theoretical climate resulting from such conditions is called *solar climate.* Actually, however, this simple distribution is profoundly modified by the thickness of the layer of air through which the sun's rays pass (depending upon the sun's altitude), the different thermal properties of land and water, the presence or absence of snow and ice, the configuration of the earth's

ANNUAL ISOTHERMS OF THE GLOBE (BUCHAN.)

surface, the prevailing winds, the distribution of water vapor, etc.

How widely the actual distribution of temperature differs from that of the solar climate may be seen from an annual isothermal chart of the globe. An *isotherm* is a line on such a chart drawn through places having the same temperature. The first isotherms of the mean annual temperature of the whole world were drawn by Humboldt in 1817, and introduced into meteorology the valuable idea of the *isogram*—i. e., a line on a chart connecting places at which equality of some physical condition exists. An isogram of barometric pressure is called an *isobar;* of rainfall, an *isohyet;* of cloudiness, an *isoneph;* of duration of sunshine, an *isohel;* etc. Upwards of eighty meteorological isograms have been given special names.[2]

The lowest temperatures on the earth occur in winter in the northeastern part of Siberia, the somewhat indefinite center of greatest cold being known as the "cold pole." At Verkhoyansk, in this region, a temperature of 90.4° below zero Fahrenheit was recorded on Jan. 15, 1885—the lowest ever reported at a regular meteorological station. The highest temperatures occur in the deserts of both the temperate and the torrid zones. At Wargla (French *Ouargla*), in the Algerian Sahara, a temperature of 127.4° Fahrenheit was recorded on July 17, 1879. Much higher temperatures have been reported—as high as 167° in the desert of Gobi—but the records in these cases are not entirely trustworthy. Of course these are all shade temperatures.

In the upper atmosphere the lowest temperatures occur at great heights over the equatorial regions, where the troposphere is thicker than in higher latitudes, and hence the ordinary fall of temperature with ascent proceeds to a greater height before the isothermal layer is reached. The lowest temperature ever registered by a sounding-balloon was 119° below zero Fahrenheit, over Victoria Nyanza, in the heart of Africa.

[2]See "The Meteorological Isograms," Scientific American Supplement, Nov. 12, 1910.

GENERAL CIRCULATION OF THE ATMOSPHERE.

In the equatorial regions the surface air is heated more than elsewhere, and tends to rise and overflow at high levels, toward the poles; while the relatively cold air of the polar regions tends to flow equatorward, near the earth's surface, to replace it. A simple circulation between the equator and

the poles could, however, only occur if the earth did not rotate on its axis.

The deflective force of the earth's rotation causes a particle of air moving in any direction over the earth's surface to deviate to the right in the northern hemisphere and to the left in the southern.

At about latitude 30° the winds coming from the equator have been so much deflected that they move almost due eastwardly. The result is a great whirl around the pole, occupying most of the temperate zone in each hemisphere, with prevailing winds from west to east at all levels. The centrifugal force of this whirl causes the air to bank up at about latitude 30°, producing a belt of high pressure in that region, which is known as the *horse latitudes*. Between this belt and the equator there is a regular circulation of air equatorward below (the *trade winds*) and poleward above (the *antitrades*); both systems being given an oblique direction by the earth's rotation. Near the equator, between the two trade wind systems, is a region of calms or variable winds, with abundant clouds and rains, known as the *doldrums*. Trades and doldrums shift north and south in the course of the year, following the sun, and give to regions which come alternately under their control successive dry and rainy seasons.

The prevailing westerly winds of middle latitudes are stronger in the southern hemisphere, where they blow mainly over the ocean and are little impeded by friction, than in the northern hemisphere; hence the violence of the winds known to mariners as the "brave west winds" in the region called the "roaring forties" (about 40° south latitude).

Within the polar circles the low temperatures increase the density of the air, which flows radially away from the poles near the earth's surface; an effect that appears to be re-enforced by the drainage of air down the glacier slopes of the two polar continents (Greenland and Antarctica).

From north to south the main wind systems of the globe run in the following sequence:

1. Arctic calms and outflowing winds, deflected westwardly (with poleward winds overhead).
2. Westerly (i. e., eastwardly) winds of middle latitudes.
3. Horse latitudes ("calms of Cancer").
4. Northeast trade winds (with southwest antitrades overhead).
5. Doldrums or equatorial calms (with east winds overhead).
6. Southeast trade winds (with northwest antitrades overhead).
7. Horse latitudes ("calms of Capricorn").
8. Westerly (i. e., eastwardly) winds of middle latitudes.
9. Antarctic calms and outflowing winds, deflected westwardly (with poleward winds overhead).

These prevailing wind systems are, however, greatly disturbed by the periodic winds due to the different thermal effects of land and water surfaces; by the surface configuration of the land; and, in middle latitudes, by the continual passage of cyclonic and anticyclonic areas.

PERIODIC WINDS.

Comparing day and night, summer and winter, the land is alternately warmer and colder than the ocean. Hence there is an annual seesaw of the winds on a vast scale between land and sea (the *monsoons*), and a daily seesaw on a smaller scale between coasts and the adjacent waters (*land and sea breezes; land and lake breezes*).

Another class of alternating winds occurs in valleys, where warm air flows up the slopes by day, and cold air drains downward by night (*mountain and valley breezes*). This phenomenon has always strongly impressed the popular imagination; and scores of winds of this class have been given individual local names. Such are the *pontias*, *vésine* and *solore* of the French Alps; the *joran* of Lake Geneva; the *breva* and the *tivano* of Lake Como, etc.

CYCLONES AND RELATED PHENOMENA.

A *cyclone, barometric depression,* or *low* is a system of winds blowing around a center of low barometric pressure. Near the earth's surface the wind is drawn spirally inward toward the center of the system, the direction of rotation being always counterclockwise in the northern hemisphere and clockwise in the southern. Hence we have *Buys Ballot's law*: Stand with your back to the wind and the barometer will be lowest on your left hand in the northern hemisphere, and on your right hand in the southern. The

air drawn into the vortex of the system rises and tends to flow spirally outward, though its actual direction is much modified by the prevailing drift of the atmosphere (west-east in middle latitudes). Besides its rotary motion, the cyclone as a whole has usually a more or less rapid translatory motion. The two motions may be compared with those of the earth, which rotates on its axis and at the same time revolves in its orbit around the sun.

Extratropical cyclones, which are responsible for the very changeable weather of the temperate zones, cover hundreds or thousands of square miles and have a translatory movement averaging 600 or 700 miles a day, usually in an eastwardly direction. They appear to be carried around the globe in the general circumpolar whirl described above. They are typically accompanied by cloudy weather, with rain or snow and rising temperature on their east and equatorward sides; and by clearing weather, with falling temperature, on their west and poleward sides.

The term *anticyclone,* or *high,* is somewhat loosely applied to any region of high barometric pressure. The typical anticyclone has a system of winds just the reverse of that found in the cyclone, outflowing below and inflowing above; and such a system is commonly assumed to be characterized by clear, cool and settled weather. In fact, however, all kinds of weather occur in anticyclones, which appear to be essentially somewhat inert masses of air which are not partaking of the circulation going on around them.

The *tropical cyclone* (*hurricane* of the West Indies; *typhoon* of the China Sea; *baguio* of the Philippines), is a relatively violent whirl, which originates in the stagnant air of the doldrums, and usually moves in an oblique and curved path toward higher latitudes, sometimes passing into the temperate zone and becoming an extratropical cyclone. These disturbances (which are always "storms," while extratropical cyclones frequently are not) are confined to certain relatively small regions of the globe, and to certain seasons. West India hurricanes are most common from July to October (the "hurricane season"). They frequently cause frightful devastation in the Caribbean Sea and the Gulf of Mexico, and on the southeastern coasts of the United States (as at Galveston, Sept. 8, 1900, when 6,000 lives and $30,000,000 in property were destroyed). The amount of shipping exposed to these storms will be much increased with the opening of the Panama Canal. Their movements are now closely watched by the U. S. Weather Bureau, which maintains observing stations in the West Indies during the hurricane season, and receives regular wireless weather reports from vessels plying in that region.

The *spout* is a vortex in the atmosphere, usually not over a few hundred feet in diameter, which begins in the upper air and is propagated downward. Its position is marked by a funnel-shaped cloud. Spouts are distinguished, according to their place of occurrence, as *landspouts* and *waterspouts,* and the more violent landspouts are called *tornadoes.* The tornado is popularly miscalled a "cyclone." These disturbances appear to be secondary phenomena of the true cyclone, and (in the northern hemisphere) occur chiefly in a region southeast of the cyclone center.

Thunderstorms are sometimes scattered phenomena, of local origin, and sometimes occur in a long line extending radially from center to border of a cyclone. In the latter case they constitute a *line-squall.* Their winds tend to rotate about a horizontal axis. Their electrical phenomena are probably the result, not the cause, of the atmospheric movements.

A wind blowing from a warm region toward a cyclonic center is called a *sirocco,* and its attendant weather is often called, in the United States, a *warm wave.* Winds blowing in winter from a cold region toward such a center bring us *cold waves,* or *blizzards* (the latter term implying the presence of driving snow as well as a low temperature).

A wind of cyclonic origin blowing down a mountain slope constitutes a *fallwind.* Such a wind, dried by the precipitation of its moisture on the windward slope, and further dried and heated by compression in its descent, is called a *foehn* (*chinook* in the northwestern United States); its effects are most striking in winter, when it sometimes raises the temperature on the lee side of the mountains 30° or 40° in a few minutes, causing the snow to disappear with astonishing rapidity. The *bora* of the Adriatic and the *mistral* of the French Riviera

differ from the foehn in the fact that they blow from a cold mountainous interior to a warm coastland, and therefore, though heated in their descent, produce the impression of a cold wind.

MOISTURE IN THE ATMOSPHERE.

For any temperature of the air there is a maximum amount of moisture that can be present in an invisible form (water vapor); when the air is charged to the limit it is said to be "saturated." *Absolute humidity* is the weight of water vapor present, per unit volume, or the tension of this vapor; *relative humidity*, the ratio of the amount present to the amount necessary for saturation, expressed in percentage. Cooling of saturated air causes condensation, in the form of cloud, fog, mist, rain, snow, hail, dew, or hoarfrost. The temperature at which condensation occurs is called the *dew-point*.

The cooling of the air leading to the formation of *clouds* occurs in a variety of ways. One of the most common is the *adiabatic* cooling of a body of air rising and expanding under diminished pressure. The upper clouds, cirrus, cirro-stratus, cirro-cumulus, consist of ice crystals; all others of water drops, though the latter often occur when the temperature is far below the freezing point, the water being "supercooled."

THE INTERNATIONAL CLASSIFICATION OF CLOUDS.

[Nearly all classifications of clouds are based upon that of Luke Howard, published in 1803. Howard defined seven types of cloud, which he named *cirrus*, *cumulus*, *stratus*, *cirro-cumulus*, *cirro-stratus*, *cumulo-stratus*, and *cumulo-cirro-stratus* or *nimbus*.

A score or more of other classifications, some of them very elaborate, have since been introduced; but the International Classification, illustrated herewith, is the only one now in general use.

The photographs numbered 1, 2, 5, 8 and 9 are from Loisel's "Atlas photographique des Nuages"; all the others are by Commander D. Wilson-Barker, R.N.R.

A cloud at the earth's surface constitutes *mist* or *fog* (nearly synonymous terms, the latter being usually preferable for technical use). *Haze* is a turbid state of the atmosphere; sometimes purely optical, sometimes mechanical. In the latter case it is often due to the presence of dust and smoke, rather than moisture, and is then called *dry fog* or *dust haze*.

Moisture deposited from the atmosphere upon the earth is called *precipitation*. In the cold season this usually takes the form of *snow*; i. e., tiny ice crystals, in a great variety of

1. Cirrus—Detached clouds of delicate or fibrous appearance often showing a featherlike structure, generally of a white color. Occasionally cirrus clouds are arranged in parallel belts which cross a portion of the sky in great circles, and by an effect of perspective appear to converge towards a point on the horizon, or if sufficiently extended towards the opposite point also. (Cirro-stratus and Cirro-cumulus are also sometimes arranged in similar bands.)

2. Cirro-Stratus.—A thin whitish sheet of cloud, sometimes covering the sky completely and giving it a milky appearance (it is then called cirro-nebula), at other times presenting more or less distinctly a formation like a tangled web. This sheet often produces halos around the sun or moon.

3. Cirro-Cumulus (Mackerel Sky).—Small globular masses or white flakes without shadows, or showing very slight shadows, arranged in groups and often in lines.

shapes; in the warm season, of *rain*.

Hail, properly so called, falls chiefly in summer thundershowers. It consists of ice and compact snow, often in concentric layers. The destruction wrought by hail throughout the world averages at least $200,000,000 a year. Many expedients have been tried to avert hailstorms; e. g., the discharge of cannon, bombs, and rockets at the clouds, and the erection of paragrêles, or "hail rods" (essentially lightning rods); but the resulting benefits are entirely illusory. The term *soft hail* is applied to little pellets of snow that fall in spring; *winter hail*, or *sleet*, to pellets of clear ice that fall in winter.

Fog drifting against terrestrial objects in cold weather leaves a rough deposit of ice known as *rime*. Rain, in cold weather, may coat such objects with a smooth sheet of ice, known as *glazed frost*. Sometimes this deposit is so heavy as to break down the branches of trees, telegraph wires, etc., constituting an *ice storm*.

Moisture condensed directly upon

4. Alto-Stratus.—A thick sheet of a grey or bluish color, sometimes forming a compact mass of dark grey color and fibrous structure. At other times the sheet is thin, resembling thick cirro-stratus, and through it the sun or the moon may be seen dimly gleaming as through ground glass. (In this picture patches of cumulus are seen in the foreground.)

5. Alto-Cumulus.—Largish globular masses, white or greyish, partially shaded, arranged in groups or lines, and often so closely packed that their edges appear confused.

objects that have been cooled by nocturnal radiation is called *dew* when liquid, *hoarfrost* when frozen.

Rainfall, as an element of climate, includes all forms of aqueous precipitation (the frozen forms being expressed in their water equivalent). Measurements of rainfall refer to the depth of water that would lie upon the ground if none of it ran off, soaked in, or evaporated. Annual rainfalls may be classified, especially with reference to agriculture, as excessive when over 75 inches; copious, 50-75 inches; moderate, 25-50 inches; light, 10-25 inches; desert, under 10 inches.

The heaviest rainfall occurs within or near the tropics. The rainiest meteorological station in the world is Cherrapunji, India, with an annual mean of 457.80 inches. Remarkable showers include one of 101.84 inches in four days, June 12-15, 1876, at Cherrapunji; and one of 135 inches in eight days in November, 1909, at Silver Hill, Jamaica (of this amount

6. Strato-Cumulus.—Large globular masses or rolls of dark clouds, frequently covering the whole sky, especially in winter. Generally it presents the appearance of a grey layer irregularly broken up into masses of which the edge is often formed of smaller masses, often of wavy appearance. Sometimes this cloud form presents the characteristic appearance of great rolls arranged in parallel lines and pressed close up to one another (roll-cumulus).

7. Nimbus.—A thick layer of dark clouds, without shape and with ragged edges from which steady rain or snow usually falls. Through the openings in these clouds an upper layer of cirro-stratus or alto-stratus may be seen almost invariably. If a layer of nimbus separates up in a strong wind into shreds, or if small loose clouds are visible floating underneath a large nimbus, they may be described as *fracto-nimbus* ("scud," of sailors).

114.50 inches fell in five days). The heaviest mean annual rainfall in the United States (not including Alaska) is about 136 inches in Tillamook County, Oregon.

No part of the world is absolutely rainless, though there are parts of the Sahara and other deserts in which whole years go by without a drop of rain.

ATMOSPHERIC ELECTRICITY.

The surface of the earth has normally a charge of negative electricity; hence, with respect to the earth, any point in the atmosphere has normally a positive potential. The *potential gradient* of the atmosphere at any time and place is the difference of potential per meter of vertical distance. It is subject to a simple yearly and a less

8. Cumulus (Wool-pack Cloud).—Thick cloud of which the upper surface is dome-shaped and exhibits protuberances while the base is horizontal. These clouds appear to be formed by a diurnal ascensional movement which is almost always noticeable. True cumulus has well defined upper and lower limits. In strong winds a broken cloud resembling cumulus is often seen in which detached portions undergo continual changes. This form is distinguished by the name *fracto-cumulus.*

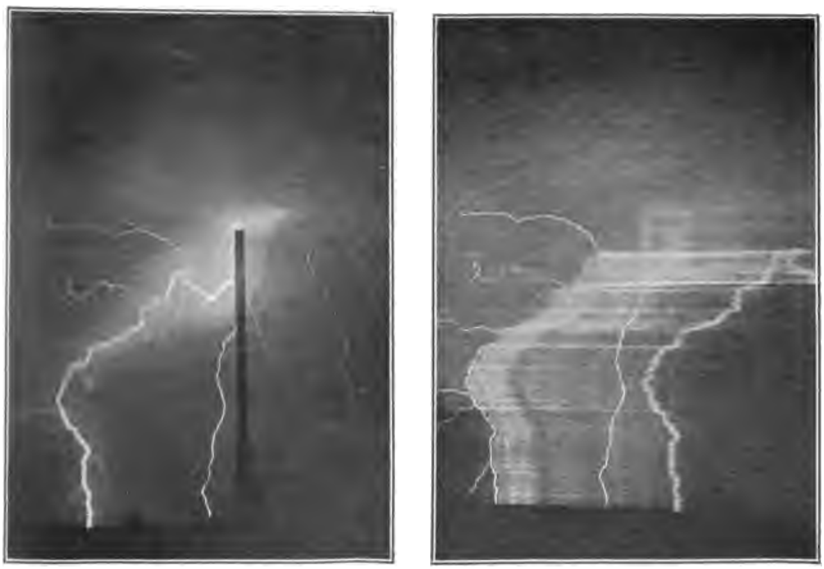
9. Cumulo-Nimbus (Thunder Cloud).—Heavy masses of cloud rising in the form of mountains or turrets or anvils generally surmounted by a sheet or screen of fibrous appearance (false cirrus), and having at its base a mass similar to nimbus. From the base local showers of rain or of snow (occasionally of hail or soft hail) usually fall. Sometimes the upper edges assume the compact form of cumulus, and form massive peaks round which the delicate "false cirrus" floats. At other times the edges themselves separate into a fringe of filaments similar to cirrus clouds.

simple daily variation. In disturbed weather, especially during thunderstorms, it fluctuates widely and rapidly, frequently changing its sign.

The *ionization of the atmosphere,* together with its effects and possible causes, forms one of the important new branches of meteorological research. Owing to the presence of ions in the atmosphere, an electrically charged body loses its charge by conduction to the surrounding air. This process, known as *dissipation,* is affected by various meteorological conditions.

An excessive difference of potential between a point in the atmosphere and the earth, or between two points in

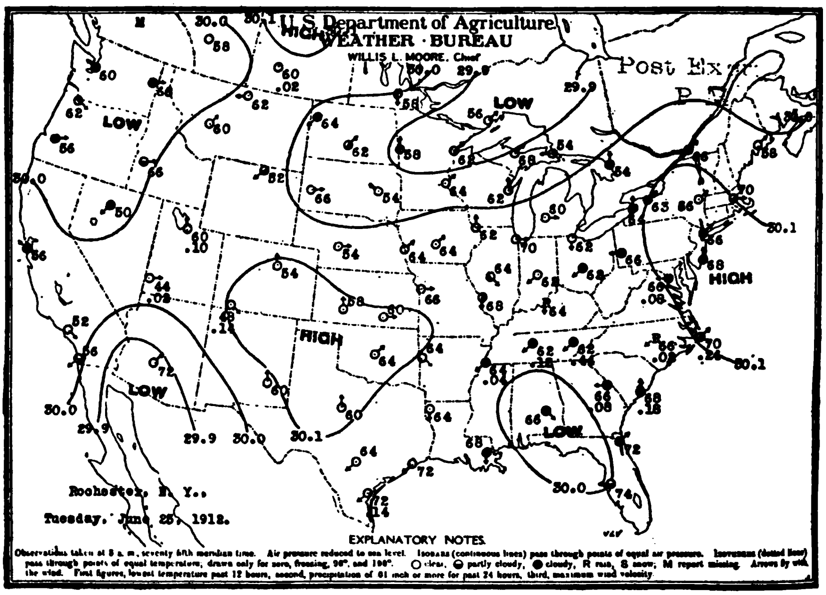
10. Stratus.—A uniform layer of cloud which resembles a fog but does not rest on the ground. If the cloud layer is broken up into irregular shreds in a wind or by mountains, it may be distinguished by the name *fracto-stratus.*



(a) (b)

Lightning flashes photographed with (*a*) stationary camera, and (*b*) moving camera. (Dr. B. Walter, Hamburg).

the atmosphere, may result in a disruptive discharge along a narrow path, known as *lightning;* or, more specifically, *linear lightning,* from which is distinguished the more gentle diffuse discharge known as *sheet lightning.* Apparent sheet lightning is often merely the reflection on the clouds of distant linear lightning; it is then distinguished as *heat lightning. St. Elmo's fire* (also called by a score of other names) is a brush



NEWSPAPER WEATHER MAP

discharge from the points of terrestrial objects, and is most common on mountain summits. *Ball lightning*, which takes the form of a ball of fire moving slowly through the air, has never been satisfactorily explained.

Photographs made with a camera turning on a vertical axis have proved that linear lightning often consists of several discharges in rapid succession along an identical path in the atmosphere.

An apparently broad stream of lightning is called *ribbon lightning*. *Beaded* or *pearl lightning* assumes the appearance of a string of brilliant beads. It is very rare. Still rarer is *rocket lightning*, which shoots up into the air at the apparent speed of a skyrocket.

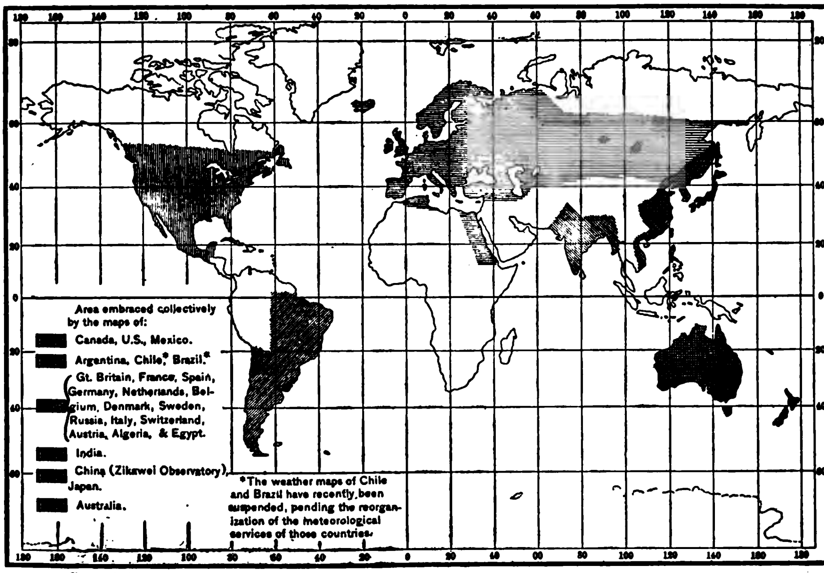
The utility of *lightning-rods* has often been questioned. The consensus of scientific opinion is that they are very useful if properly constructed; otherwise they are worse than useless.

The *aurora polaris* is now most commonly attributed to the passage of cathode rays through the atmosphere, under the effects of some kind of radiation or emission from the sun. Its variations are generally synchronous with those of solar activity and terrestrial magnetism. The aurora is best studied by means of simultaneous photographs from two stations, and with the spectroscope. There appear to be two principal forms; (1) the tranquil, homogeneous arc (part of a great circumpolar ring), occurring only at great altitudes; and (2) shifting beams and draperies, occurring mainly at lower levels. There is some evidence that a feeble auroral glow commonly extends over the whole nocturnal sky, in all latitudes (*earth-light*).

ATMOSPHERIC OPTICS.

The optical phenomena of the atmosphere (*photometeors*) include astronomical refraction, the colors of the sky, twilight phenomena, polarization of skylight, scintillation, mirage, the transparency of the atmosphere, and various luminous appearances, including rainbows, coronas, glories and halos.

The *rainbow* is due to the refraction and reflection of light in water drops (usually raindrops). ***Primary***



LAND AREAS EMBRACED IN THE PUBLISHED DAILY WEATHER MAPS OF THE WORLD.

and *secondary bows* (often bordered with *supernumerary* or *spurious bows*) are seen opposite the sun; the higher the sun, the lower the system of bows, and vice versa. Bows of higher order (tertiary, quaternary, etc.) are of theoretical interest only; they are rarely, if ever, seen. The reflected image of the sun in a sheet of water may give rise to *intersecting rainbows.* Lunar rainbows are sometimes seen; they are, as a rule, nearly colorless, owing to feeble illumination.

The *corona* is a small ring, or series of rings, of prismatic colors, surrounding the sun or moon; it is due to the diffraction of light by water drops, ice crystals or dust. Fine dust in the atmosphere (as after the eruption of Krakatoa) gives rise to a large corona known as *Bishop's ring*.

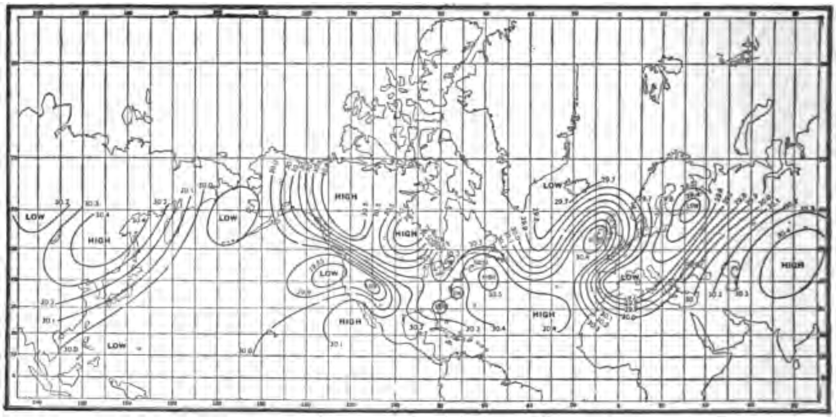
From a mountain top or other elevation a person sometimes sees his shadow cast on a bank of fog or cloud. (The shadow seems "gigantic" owing to overestimation of its distance.) The head is often surrounded by a *glory* of colored light, due to diffraction. The whole phenomenon is called the *specter of the Brocken.* Very striking examples are seen from balloons.

Halos are due to the refraction or reflection (or both) of light by ice crystals in the atmosphere. These may take the form of rings of definite angular size (the commonest has a radius of 22°) surrounding the sun or moon; also of rings or arcs in various other positions, and discs of light (*parhelia*, or *paraselenæ*; in popular language, "sundogs" or moondogs"). Some halos are distinctly colored, others are not. Complete descriptions and discussions of halo phenomena, scores of which have been classified, are found only in certain French and German works.[1]

CLIMATE.

Climate is often defined as average weather; and climatic statistics refer mainly to average conditions. It would be better, however, to define it as "the sum total of weather,"

[1]On the descriptive side the best account is L. Besson's "Les différentes formes de halo et leur observation," published in *L'Astronomie,* Paris, March-May, 1911.



Daily synoptic weather chart of the Northern Hemisphere. (Chart of Jan. 13, 1911.) It is prepared daily, in manuscript, at Washington from telegraphic reports, but is not published. The curved lines are isobars, or lines of equal barometric pressure.

since occasional departures from the average, in the shape of hot and cold waves, droughts and excessive rain, severe storms, etc., aid in giving character to the climate of the places where they occur.

Climatology is the science of climate in general; *climatography* is devoted to the description of particular climates.

That "the climate has changed" within a generation or so is a stubborn popular delusion, which prevails all over the world, and has probably prevailed in every age. It arises from the fact that exceptional weather impresses itself more lastingly upon the memory than normal weather.

METEOROLOGICAL SERVICES AND THEIR WORK; WEATHER PREDICTION.

The central organization is the International Meteorological Committee, which meets triennially; president, Dr. W. N. Shaw, director of the British Meteorological Office, London; secretary, Dr. G. Hellmann, director of the Royal Prussian Meteorological Institute, Berlin. Under this committee are several international "commissions" on special subjects. Occasionally an International Meteorological Conference is held, comprising the directors of all meteorological services.

Practically every civilized country has an official weather service; some have more than one. These services issue weather maps and weather forecasts, and compile climatic statistics. The national weather service of the United States is the Weather Bureau of the Department of Agriculture, with headquarters in Washington; its chief is Prof. Willis L. Moore.

A weather service consists of a central station or observatory, and a "réseau" of subordinate stations scattered over the country. The stations are of two principal classes: (1) *Telegraphic stations*, at which meteorological observations are made simultaneously at fixed hours (in the United States, 8 a. m. and 8 p. m., eastern standard time), and immediately telegraphed to headquarters, where they are charted to form the *weather map* which is the basis of the *weather forecast*. (2) *Climatological stations*, largely manned by volunteer observers. Their reports are sent in by post,

BEAUFORT WIND SCALE.

0 Calm	Equivalent velocity	0	miles per hour.
1 Light Air	" "	1-3	"
2 Light Breeze	" "	4-7	"
3 Gentle "	" "	8-12	"
4 Moderate "	" "	13-18	"
5 Fresh "	" "	19-24	"
6 Strong "	" "	25-31	"
7 High Wind (Moderate Gale)	" "	32-38	"
8 Gale	" "	39-46	"
9 Strong Gale	" "	47-54	"
10 Whole "	" "	55-63	"
11 Storm	" "	64-75	"
12 Hurricane	" "	above 75	"

and are utilized especially in compiling climatic statistics. Certain countries, including the United States, receive reports from observers on shipboard, and compile meteorological statistics for the oceans. Many marine observers now send reports by wireless telegraphy.

The cardinal principle of forecasting from the weather map is the fact that the weather depends mainly upon the movement of cyclones and anticyclones. The distribution of weather in these systems has been described above. Broadly speaking, the weather, in the temperate zones, moves from west to east.

The prediction of ordinary weather changes, from day to day, is the least successful and the least important part of forecasting. On the other hand, such phenomena as severe storms, cold waves, heavy snowfall disastrous night frosts, and other occurrences of far-reaching importance are predicted with great accuracy.

The latest development of weather forecasting in the United States is the *daily weather map of the northern hemisphere.* It has proved the importance of certain quasi-permanent areas of high and low pressure (for example, the great "high" that prevails over Siberia in winter) in determining the movements of the subordinate "highs" and "lows" that directly control the weather.

River stage prediction has reached a high degree of accuracy, especially in the United States, where numerous river-gages and rainfall stations are maintained in every important river basin, and it is possible to predict the stage of a river, at a given point, from three or four days to three weeks in advance, within a limit of error of a few inches.

METEOROLOGY AND AERONAUTICS.

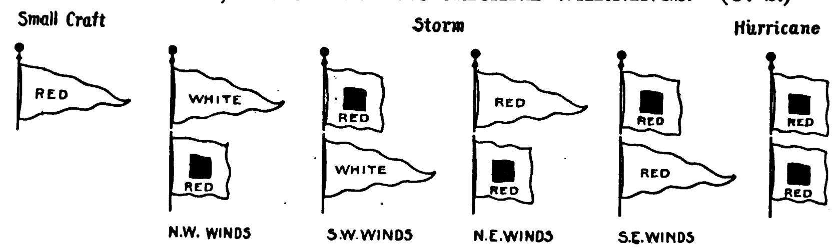
Meteorological investigations have received a great impetus through the development of aeronautics. The requirements of this art have given a practical *raison d'être* to the world-wide campaign of upper air, or free air, research that has been carried on by meteorologists since the beginning of the present century.

In the year 1911 was published the first general textbook of *aeronautical meteorology* (by Linke), a practical science that aims to do for the aeronaut what marine meteorology and hydrography combined do for the mariner.

Special weather predictions for aeronauts have been undertaken experimentally in Germany; where an "aeronautical weather bureau" has its headquarters at Lindenberg and a network of telegraphic reporting stations throughout the country at which daily observations of the upper air currents are made with pilot balloons.

SENDING UP A PILOT BALLOON
to determine the speed and direction of the air currents at various levels. The movement of the balloon is observed with a theodolite.

SMALL CRAFT, STORM AND HURRICANE WARNINGS. (U. S.)



EXPLANATION OF WEATHER FLAGS. (U. S.)

EXPLANATION OF SMALL CRAFT, STORM AND HURRICANE WARNINGS.

Small craft warning.—A red pennant indicates that moderate winds are expected.

Storm warning.—A red flag with a black center indicates that a storm of marked violence is expected.

The pennants displayed with the flags indicate the direction of the wind: white, westerly (from southwest to north); red, easterly (from northeast to south). The pennant above the flag indicates that the wind is expected to blow from the northerly quadrants; below, from the southerly quadrants.

By night a red light indicates easterly winds, and a white light below a red light, westerly winds

Hurricane warning.—Two red flags with black centers, displayed one above the other, indicate the expected approach of a tropical hurricane, or one of those extremely severe and dangerous storms which occasionally move across the Lakes and northern Atlantic coast.

No night small craft or hurricane warnings are displayed.

INTERPRETATION OF DISPLAYS

No. 1, alone, indicates fair weather, stationary temperature.

No. 2, alone, indicates rain or snow, stationary temperature.

No. 3, alone, indicates local rain or snow, stationary temperature.

No. 1, with No. 4 above it, indicates fair weather, warmer.

No. 1, with No. 4 below it, indicates fair weather, colder.

No. 2, with No. 4 above it, indicates rain or snow, warmer.

No. 2, with No. 4 below it, indicates rain or snow, colder.

No. 3, with No. 4 above it, indicates local rain or snow, warmer.

No. 3, with No. 4 below it, indicates local rain or snow, colder.

INTERNATIONAL STORM SIGNALS.

For a gale commencing with wind in the NW. quadrant.

For a gale commencing with wind in the SW. quadrant.

For a gale commencing with wind in the NE. quadrant.

For a gale commencing with wind in the SE. quadrant.

For a hurricane.

MEAN TEMPERATURE F° AND MEAN ANNUAL PRECIPITATION.

Name of Place.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Years Record	Precip. (in ins.)	Years.
Algiers	53.4	55.4	57.6	61.0	65.8	71.4	77.0	77.5	74.8	68.5	62.4	55.6	22	30.12	(67)
Athens	47.5	48.9	53.4	59.5	68.0	75.9	81.1	80.4	74.3	66.9	57.4	50.9	46	15.35	(47)
Auckland	66.6	67.3	65.7	61.3	57.0	53.8	52.0	52.0	54.5	57.0	59.0	64.2	15	43.73	(45)
Bergen	34.2	33.6	35.4	42.1	48.9	55.0	57.9	57.6	52.7	45.1	38.5	34.7	50	77.09	(54)
Bombay	74.5	74.8	78.1	82.0	84.6	82.4	79.5	79.3	79.3	80.8	79.3	76.5	..	74.02	(..)
Brussels	34.3	36.1	39.7	46.9	53.2	59.7	63.0	62.2	57.7	49.5	41.2	35.6	50	28.78	(58)
Cairo, Egypt	54.1	56.8	62.4	70.2	76.8	81.9	83.5	82.6	78.1	71.4	65.1	57.9	35	1.26	(20)
Calcutta	65.1	70.3	79.3	84.9	85.6	84.6	82.9	82.4	82.6	80.1	72.3	65.3	..	60.79	(72)
Chicago, Ill	23.7	25.4	34.4	45.9	56.5	66.3	72.4	71.2	64.6	53.2	39.2	29.3	33	33.29	(35)
Christiania	24.1	23.9	29.5	39.9	50.9	59.9	62.6	60.6	52.7	41.9	32.2	25.5	50	22.95	(25)
Christchurch, N. Z.	61.7	60.8	58.5	53.1	48.4	45.0	42.4	43.9	48.6	52.7	56.3	60.8	15	25.24	(21)
Colombo, Ceylon	79.0	79.7	80.6	81.5	82.0	80.4	80.1	80.4	80.4	79.3	79.5	79.2	..	88.27	(..)
Constantinople	41.4	41.4	46.2	53.4	62.4	70.3	74.3	74.5	68.4	62.2	53.2	45.7	47	28.86	(48)
Dunedin, N. Z.	57.7	57.4	55.4	51.4	47.3	44.1	42.4	44.1	46.8	50.7	53.2	56.3	15	34.56	(32)
Florence	40.8	43.9	48.9	56.1	63.1	70.7	76.1	74.8	68.5	58.8	49.3	42.6	39	35.00	(73)
Geneva	32.0	53.6	40.8	48.9	55.9	62.8	67.1	64.9	59.2	49.1	40.8	33.6	37	33.82	(37)
Jerusalem	44.6	47.5	51.4	58.8	66.9	70.3	73.2	73.4	70.3	66.4	55.9	48.9	14	26.02	(48)
Khartoum	71.4	75.6	80.4	84.7	92.1	91.8	88.3	87.3	88.5	88.2	82.0	74.8	6½	5.16	(9)
Lisbon	49.3	52.0	54.1	56.5	60.8	66.4	70.4	70.2	68.0	61.5	56.1	50.7	20	28.58	(95)
London	38.1	39.7	42.1	48.0	53.8	60.3	63.1	62.1	57.6	49.8	43.0	39.2	..	25.47	(40)
Madras	75.4	76.6	79.5	84.2	88.7	88.3	85.6	84.6	83.8	80.8	77.9	75.7	..	48.84	(..)
Madrid	39.7	43.9	47.5	52.3	59.4	68.5	75.7	74.8	66.4	54.9	47.1	40.1	20	16.50	(30)
Malaga	53.6	55.4	57.6	61.5	65.7	71.4	76.8	77.2	72.5	66.0	60.3	55.4	20	23.90	(8)
Malta	53.4	53.4	55.0	58.6	63.9	70.9	76.5	77.2	74.1	68.9	61.7	55.8	48	20.35	(19)
Melbourne	67.5	67.3	64.6	59.7	54.0	50.0	48.7	51.1	54.0	57.6	61.2	64.6	51	25.47	(51)
Milan	32.4	38.1	46.0	55.2	62.6	70.0	74.8	73.0	66.0	55.6	44.1	35.6	50	39.65	(151)
Naples	46.8	48.4	51.4	56.8	63.7	70.3	75.6	75.0	69.8	63.1	54.7	48.7	50	32.76	(84)
New Orleans, La	53.0	56.3	62.0	67.9	74.5	79.6	81.3	81.0	78.0	69.5	60.6	54.4	33	57.42	(35)
New York	30.2	30.7	37.5	48.1	59.3	68.5	73.5	72.2	66.5	55.6	44.0	34.4	33	44.63	(35)
Nice	46.4	47.5	50.7	56.6	62.2	69.1	73.8	73.2	68.2	61.0	52.7	47.3	50	33.74	(16)
Paris	36.5	39.0	43.2	50.5	56.1	62.4	65.5	64.4	59.0	50.5	42.8	37.2	50	21.93	(30)
Rangoon	74.7	77.4	81.1	84.9	82.2	79.5	78.8	78.6	79.2	80.1	78.3	75.6	..	98.82	(..)
Rome	44.1	46.6	50.7	56.5	64.0	71.2	76.6	75.7	70.2	61.7	52.3	45.9	50	31.61	(80)
San Francisco	49.5	51.3	52.7	53.7	55.5	57.0	57.3	58.0	59.3	58.4	55.5	50.9	33	22.27	(35)
Sydney	71.4	71.1	69.3	64.6	58.5	54.3	52.3	54.9	58.8	63.5	66.9	70.0	46	48.35	(49)
Venice	36.5	40.6	46.6	55.8	63.5	71.4	76.3	74.7	68.0	58.5	47.1	39.6	50	29.53	(69)
Vienna	28.9	32.4	39.0	48.9	57.2	63.9	67.3	65.8	59.4	49.6	38.3	30.9	50	24.53	(56)
Wellington, N. Z.	62.4	62.2	61.0	57.4	52.9	49.6	47.5	48.6	51.1	54.0	56.8	60.8	15	50.63	(40)

Prepared by United States Weather Bureau especially for this book.

LOWEST TEMPERATURE: RECORD TO DECEMBER 31, 1911, BY MONTHS, AT SPECIFIED STATIONS.

[Source: The Weather Bureau, Department of Agriculture.]

Station.	Number of years record.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
		°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Abilene, Tex	25	−5	−6	17	25	33	48	54	55	40	30	13	1	−6
Albany, N. Y	37	−24	−18	−8	13	29	40	48	45	32	23	−10	−17	−24
Amarillo, Tex	19	−6	−16	−2	22	26	42	51	49	36	23	4	−1	−16
Atlanta, Ga	32	−2	−8	8	25	38	39	58	55	43	30	16	1	−8
Bismarck, N. Dak	36	−44	−43	−36	−3	13	31	32	32	10	−2	−28	−38	−44
Boise, Idaho	32	−28	−12	5	17	26	30	40	32	28	16	−10	−7	−28
Boston, Mass	40	−13	−11	−8	11	31	42	46	47	34	25	−2	−12	−13
Buffalo, N. Y	38	−14	−13	−4	11	28	39	47	44	35	24	2	−9	−14
Charlotte, N. C	32	−1	−5	14	26	37	45	55	53	38	28	18	−5	−5
Chicago, Ill	38	−20	−21	−12	17	27	40	50	47	32	14	−2	−23	−23
Cleveland, Ohio	38	−17	−16	−4	15	28	38	46	46	36	24	0	−12	−17
Denver, Colo	38	−29	−22	−11	4	19	36	42	40	21	1	−18	−25	−29
Des Moines, Iowa	32	−30	−26	−8	11	26	37	48	40	26	14	−10	−20	−30
Dodge, Kans	36	−20	−26	−9	13	19	40	46	45	30	10	−13	−15	−26
Dubuque, Iowa	37	−32	−31	−12	14	26	39	40	41	24	15	−12	−24	−32
Duluth, Minn	38	−41	−36	−26	3	16	33	44	40	28	8	−29	−34	−41
Eastport, Me	37	−20	−20	−8	2	28	30	45	44	30	23	−13	−21	−21
El Paso, Tex	32	5	5	21	29	40	49	56	52	42	26	11	−5	−5
Fresno, Cal	23	20	24	28	34	38	42	50	51	42	36	27	23	20
Galveston, Tex	39	11	8	30	43	52	57	66	68	54	44	29	18	8
Green Bay, Wis	24	−36	−33	−23	11	26	34	43	40	25	8	−12	−21	−36
Harrisburg, Pa	22	−5	−13	5	22	34	43	50	49	36	28	11	4	−13
Havre, Mont	19	−43	−48	−41	−11	15	31	31	27	18	−7	−33	−43	−48
Helena, Mont	30	−42	−41	−20	6	22	31	36	29	20	3	−22	−40	−42
Huron, S. Dak	29	−43	−37	−25	7	20	31	41	33	18	3	−28	−34	−43
Indianapolis, Ind	37	−25	−18	0	19	31	39	48	46	30	22	−5	−15	−25
Jacksonville, Fla	39	15	10	26	34	46	54	66	64	49	40	26	14	10
Jupiter, Fla	23	24	27	33	39	53	64	68	68	61	48	36	24	24
Kansas City, Mo	22	−17	−22	2	22	27	48	54	46	35	26	4	−13	−22
Knoxville, Tenn	40	−16	−10	5	24	34	42	52	50	35	25	12	−5	−16
Lander, Wyo	19	−36	−35	−24	2	13	26	34	23	7	2	−31	−30	−36
Little Rock, Ark	31	−5	−12	16	28	39	51	60	52	41	31	10	6	−12
Los Angeles, Cal	33	30	28	31	36	40	46	49	49	44	40	42	30	28
Louisville, Ky	38	−20	−14	3	21	33	43	54	50	36	26	4	−7	−20
Lynchburg, Va	37	−6	−3	14	25	34	45	53	47	35	27	13	−5	−6
Montgomery, Ala	38	5	−5	21	30	35	48	61	58	45	31	21	8	−5
New Orleans, La	40	15	7	30	38	52	58	66	63	55	40	29	20	7
New York, N. Y	39	−6	−6	3	20	34	45	50	51	36	31	7	−6	−6
Northfield, Vt	23	−32	−35	−18	−1	18	30	34	31	23	12	−14	−27	−35
North Platte, Nebr	36	−35	−35	−21	12	19	33	42	36	21	9	−25	−30	−35
Oklahoma, Okla	20	−11	−17	9	22	33	48	56	49	36	27	9	−2	−17
Omaha, Nebr	38	−32	−26	−7	6	25	42	50	44	30	15	−14	−17	−32
Oswego, N. Y	40	−23	−18	−11	13	27	39	45	44	35	24	−1	−18	−23
Palestine, Tex	29	0	−6	20	36	39	48	60	54	43	31	20	8	−6
Parkersburg, W. Va	22	−11	−27	4	20	31	42	48	45	33	20	15	−5	−27
Phoenix, Ariz	28	12	19	24	30	35	33	46	49	39	34	24	18	12
Port Huron, Mich	36	−15	−25	−14	7	26	35	42	41	30	19	−6	−14	−25
Portland, Oreg	37	−2	7	20	28	32	39	43	43	35	31	11	3	−2
Rapid City, S. Dak	23	−37	−40	−17	−2	19	35	37	36	23	10	−9	−25	−40
Red Bluff, Cal	33	18	22	26	30	37	44	53	52	45	32	26	25	18
St. Louis, Mo	40	−22	−18	3	22	32	44	55	52	37	24	5	−17	−22
St. Paul, Minn	38	−41	−33	−22	7	23	36	45	40	28	12	−24	−39	−41
Salt Lake City, Utah	36	−20	−13	0	18	25	33	43	44	29	22	−2	−10	−20
San Antonio, Tex	33	6	4	21	35	44	53	58	57	46	36	21	10	4
San Francisco, Cal	39	29	33	33	40	43	46	47	47	47	45	38	34	29
Santa Fe, N. Mex	37	−13	−11	0	11	20	33	43	40	21	13	−11	−13	−13
Sault Ste. Marie, Mich	22	−28	−37	−27	3	21	32	39	37	28	16	−7	−19	−28
Seattle, Wash	17	11	12	20	31	36	42	48	46	36	31	15	25	11
Shreveport, La	37	1	−5	22	32	42	53	62	54	44	31	18	10	−5
Spokane, Wash	29	−30	−25	−10	22	29	34	41	38	26	12	−13	−18	−30
Springfield, Ill	31	−22	−24	2	19	32	40	49	48	31	20	2	−14	−24
Springfield, Mo	23	−17	−29	3	22	30	46	53	44	35	21	6	−11	−29
Tampa, Fla	20	23	22	32	38	53	64	65	66	54	44	32	19	19
Vicksburg, Miss	38	3	−1	24	31	43	52	62	54	42	34	22	12	−1
Walla Walla, Wash	25	−17	−15	2	29	35	40	45	41	36	24	−9	−2	−17
Washington, D. C	40	−14	−15	4	22	33	43	52	49	36	26	12	−13	−15
Williston, N. Dak	32	−49	−49	−35	−4	14	30	36	32	13	−3	−29	−46	−49
Wilmington, N. C	40	9	5	20	28	38	51	58	56	42	32	20	10	5
Winnemucca, Nev	31	−28	−22	−3	12	17	29	33	26	16	10	−9	−20	−28

HIGHEST TEMPERATURE: RECORD TO DECEMBER 31, 1911, BY MONTHS, AT SPECIFIED STATIONS.

[Source: The Weather Bureau, Department of Agriculture.]

Station.	Number of years record.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
		°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Abilene, Tex.	25	90	92	95	99	105	110	110	105	104	94	88	83	110
Albany, N. Y.	37	64	63	79	88	97	99	104	98	97	90	71	66	104
Amarillo, Tex.	19	82	84	96	90	98	105	100	102	101	94	83	75	105
Atlanta, Ga.	32	75	78	87	89	94	98	100	98	97	94	82	73	100
Bismarck, N. Dak.	36	60	64	81	90	96	103	107	105	102	91	73	64	107
Boise, Idaho	32	62	67	77	92	100	105	111	106	100	91	72	62	111
Boston, Mass.	40	70	64	78	85	97	98	104	97	102	90	76	67	104
Buffalo, N. Y.	38	70	67	79	84	94	93	95	94	95	86	70	64	95
Charlotte, N. C.	32	77	79	91	94	97	102	102	100	99	92	80	76	102
Chicago, Ill.	38	64	63	81	88	94	98	103	98	98	87	75	68	103
Cleveland, Ohio	38	71	72	83	87	92	96	97	99	98	87	74	68	99
Denver, Colo.	38	76	77	82	86	92	99	102	105	97	90	77	74	105
Des Moines, Iowa	32	64	70	88	92	94	101	109	103	99	91	76	69	109
Dodge, Kans.	36	76	83	98	95	101	107	108	105	101	94	84	79	108
Dubuque, Iowa	37	63	67	86	88	94	99	106	100	97	89	74	67	106
Duluth, Minn.	38	51	58	70	82	91	97	99	95	94	80	73	54	99
Eastport, Me.	37	54	52	57	72	85	88	93	90	89	83	64	54	93
El Paso, Tex.	32	77	86	93	98	105	113	112	110	104	94	85	77	113
Fresno, Cal.	23	72	83	87	101	110	112	115	113	111	100	84	74	115
Galveston, Tex.	39	75	76	85	85	93	97	98	98	94	91	85	77	98
Green Bay, Wis.	24	51	59	82	84	91	100	100	98	95	84	69	51	100
Harrisburg, Pa.	22	67	74	83	92	95	97	101	98	95	88	75	66	101
Havre, Mont.	19	61	63	77	94	92	108	103	106	93	88	75	63	108
Helena, Mont.	30	63	65	72	86	89	102	103	98	91	84	71	46	103
Huron, S. Dak.	29	64	68	85	94	96	100	108	108	106	94	77	65	108
Indianapolis, Ind.	37	70	72	84	87	96	100	106	101	98	89	76	68	106
Jacksonville, Fla.	39	81	86	91	92	98	100	104	101	98	95	86	81	104
Jupiter, Fla.	23	83	87	89	90	93	95	96	96	93	94	87	86	96
Kansas City, Mo.	22	70	76	90	95	92	100	106	104	101	91	80	70	106
Knoxville, Tenn.	40	76	79	87	90	94	99	100	100	99	94	80	75	100
Lander, Wyo.	19	59	64	71	82	86	95	99	96	90	82	72	57	99
Little Rock, Ark.	31	78	80	89	94	94	102	106	105	101	93	84	78	106
Los Angeles, Cal.	33	87	88	99	100	103	105	109	106	108	102	96	89	109
Louisville, Ky.	38	74	78	88	91	98	100	107	105	102	91	79	74	107
Lynchburg, Va.	37	77	75	92	95	97	98	102	100	99	92	81	73	102
Montgomery, Ala.	38	79	83	90	92	98	106	107	103	99	96	85	79	107
New Orleans, La.	40	82	82	86	89	96	98	102	100	96	94	89	83	102
New York, N. Y.	39	67	69	78	90	95	97	99	96	100	88	74	68	100
Northfield, Vt.	23	61	59	75	85	93	95	98	92	90	83	70	61	98
North Platte, Nebr.	36	70	74	86	95	97	104	107	103	101	94	81	72	107
Oklahoma, Okla.	20	83	90	90	95	95	106	104	108	102	97	86	75	108
Omaha, Nebr.	38	63	78	91	94	97	102	107	105	102	92	80	71	107
Oswego, N. Y.	40	69	61	78	85	94	98	100	98	93	84	75	66	100
Palestine, Tex.	29	84	83	90	92	96	100	103	108	104	97	87	81	108
Parkersburg, W. Va.	22	74	76	86	93	94	99	102	98	99	90	78	72	102
Phoenix, Ariz.	28	87	92	97	105	114	119	117	116	114	105	97	95	119
Port Huron, Mich.	36	64	60	77	84	93	97	101	99	97	87	69	65	101
Portland, Oreg.	37	62	68	79	90	99	99	102	97	93	83	73	65	102
Rapid City, S. Dak.	23	69	72	85	90	92	103	106	106	102	96	79	75	106
Red Bluff, Cal.	33	77	82	86	96	110	110	115	114	108	97	88	76	115
St. Louis, Mo.	40	74	84	90	91	94	102	107	106	102	91	82	74	107
St. Paul, Minn.	38	51	61	83	87	94	98	104	100	96	87	74	58	104
Salt Lake City, Utah	36	60	68	77	85	93	101	102	101	93	88	74	61	102
San Antonio, Tex.	33	87	90	97	99	104	105	106	108	103	99	89	86	108
San Francisco, Cal.	39	78	80	80	88	97	100	98	92	101	94	83	72	101
Santa Fe, N. Mex.	37	76	75	82	84	89	92	96	97	90	85	77	65	97
Sault Ste. Marie, Mich.	22	46	46	64	77	90	93	97	90	91	80	67	48	97
Seattle, Wash.	17	61	67	75	85	90	96	95	92	87	81	68	62	96
Shreveport, La.	37	83	82	90	96	101	104	107	110	101	95	86	79	110
Spokane, Wash.	29	55	59	74	87	95	96	103	104	98	86	70	57	104
Springfield, Ill.	31	73	72	91	89	95	101	107	100	99	91	77	67	107
Springfield, Mo.	23	75	84	92	89	90	98	106	102	102	90	79	74	106
Tampa, Fla.	20	82	86	92	90	94	95	96	96	94	93	87	83	96
Vicksburg, Miss.	38	82	83	88	92	97	101	100	100	98	94	86	79	101
Walla Walla, Wash.	25	67	69	79	92	100	105	111	113	100	87	78	65	113
Washington, D. C.	40	76	78	93	93	96	102	103	101	104	92	80	73	104
Williston, N. Dak.	32	52	58	72	92	101	107	106	107	101	95	71	59	107
Wilmington, N. C.	40	80	81	94	90	97	100	103	99	96	92	83	78	103
Winnemucca, Nev.	31	59	69	82	83	98	98	104	102	94	87	73	65	104

NORMAL TEMPERATURE: MONTHLY AND ANNUAL MEANS AT SPECIFIED STATIONS.[1]

[Source: The Weather Bureau, Department of Agriculture.]

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Abilene, Tex	43	45	55	64	72	78	82	81	74	64	53	45	63
Albany, N. Y	22	24	32	46	59	68	72	70	62	50	38	28	48
Amarillo, Tex	34	37	45	55	64	72	76	75	68	56	44	36	55
Atlanta, Ga	42	45	52	61	70	76	78	76	72	62	52	45	61
Bismarck, N. Dak	7	8	22	43	55	64	70	68	57	44	26	15	40
Boise, Idaho	29	34	42	50	58	66	73	72	62	50	40	32	51
Boston, Mass	27	28	35	45	57	66	71	69	63	52	41	32	49
Buffalo, N. Y	25	24	31	42	54	65	70	69	63	52	39	30	47
Charlotte, N. C	40	44	51	59	68	76	79	77	71	61	50	43	60
Chicago, Ill	24	25	34	46	56	66	72	71	65	53	39	29	48
Cleveland, Ohio	26	27	34	46	58	68	72	70	64	53	40	31	49
Denver, Colo	29	31	39	48	57	66	72	70	63	51	39	32	50
Des Moines, Iowa	20	24	36	51	62	70	76	73	65	52	37	26	49
Dodge, Kans	27	31	42	54	64	73	78	76	68	55	40	32	53
Dubuque, Iowa	18	22	33	49	61	70	75	72	64	52	36	24	48
Duluth, Minn	10	14	24	38	49	58	66	65	57	45	29	18	39
Eastport, Me	20	21	29	38	47	54	60	60	55	47	37	25	41
El Paso, Tex	44	49	56	64	72	80	80	79	73	62	51	45	63
Fresno, Cal	45	49	55	61	68	76	82	81	74	65	55	47	63
Galveston, Tex	53	56	62	69	75	81	83	83	79	72	63	56	69
Green Bay, Wis	15	17	27	41	54	65	70	67	59	47	32	21	43
Harrisburg, Pa	29	30	38	51	62	70	74	72	65	54	42	33	52
Havre, Mont	14	15	27	43	54	62	68	67	58	44	31	21	42
Helena, Mont	20	22	31	42	52	61	67	66	56	44	33	25	43
Huron, S Dak	10	13	27	45	57	67	72	69	60	45	27	16	42
Indianapolis, Ind	28	31	40	52	63	72	76	74	67	55	42	33	53
Jacksonville, Fla	54	57	62	68	74	79	81	80	77	70	61	55	68
Jupiter, Fla	64	66	69	72	76	80	81	82	81	77	72	66	74
Kansas City, Mo	26	30	41	54	64	73	78	76	68	56	42	32	53
Knoxville, Tenn	38	41	48	57	66	73	76	75	69	58	47	40	57
Lander, Wyo	17	22	31	42	52	61	68	66	55	42	29	19	42
Little Rock, Ark	41	44	53	63	70	77	81	79	73	63	52	44	62
Los Angeles, Cal	54	55	57	59	62	67	70	72	70	65	60	56	62
Louisville, Ky	34	37	45	56	67	75	79	76	70	58	46	38	57
Lynchburg, Va	36	38	45	56	66	74	77	75	68	57	46	38	56
Montgomery, Ala	48	51	58	65	74	79	81	80	76	66	56	49	65
New Orleans, La	53	56	62	68	74	80	81	81	78	70	61	54	68
New York, N. Y	30	31	38	48	59	68	74	72	66	56	44	34	52
Northfield, Vt	15	17	26	40	54	63	67	63	55	44	32	20	41
North Platte, Nebr	21	25	35	49	59	68	74	72	63	50	35	27	48
Oklahoma, Okla	35	38	49	60	68	76	80	78	72	61	48	39	59
Omaha, Nebr	20	24	36	50	62	72	76	74	66	54	38	27	50
Oswego, N. Y	24	24	31	43	55	64	70	69	63	51	39	29	47
Palestine, Tex	46	51	58	66	72	78	82	80	75	66	57	49	65
Parkersburg, W. Va	31	34	42	53	63	72	76	73	66	55	43	35	54
Phoenix, Ariz	50	54	60	67	75	84	90	89	81	70	59	52	69
Port Huron, Mich	22	22	30	42	54	64	69	67	61	50	37	27	45
Portland, Oreg	39	41	46	51	57	61	66	66	61	53	46	41	52
Rapid City, S. Dak	22	24	32	44	54	64	70	69	59	47	34	26	45
Red Bluff, Cal	45	49	54	59	66	76	82	81	74	64	53	46	62
St. Louis, Mo	31	34	44	56	66	75	79	77	70	58	43	36	56
St. Paul, Minn	12	15	28	46	58	67	72	70	60	48	31	19	44
Salt Lake City, Utah	29	33	41	50	58	68	76	76	65	52	40	32	52
San Antonio, Tex	51	54	62	69	75	80	82	82	77	69	59	53	68
San Francisco, Cal	50	51	53	54	56	57	57	58	59	58	56	51	55
Santa Fe, N. Mex	28	32	39	48	57	66	69	67	61	50	38	30	49
Sault Ste. Marie, Mich	13	13	21	36	48	58	62	61	54	43	31	20	38
Seattle, Wash	39	40	44	49	55	60	64	63	58	51	44	41	51
Shreveport, La	46	50	58	66	73	80	82	81	76	66	55	49	65
Spokane, Wash	27	30	39	48	56	63	69	68	59	47	37	31	48
Springfield, Ill	26	29	39	52	64	72	76	74	66	55	41	31	52
Springfield, Mo	31	34	44	56	65	72	76	75	68	57	44	36	55
Tampa, Fla	57	61	66	71	76	79	80	80	78	73	65	60	70
Vicksburg, Miss	47	51	58	65	73	78	80	80	75	65	56	49	65
Walla Walla, Wash	33	36	44	53	61	68	74	74	65	54	43	36	53
Washington, D. C	33	34	42	53	64	73	77	74	68	57	45	36	55
Williston, N. Dak	6	8	22	40	54	64	69	68	60	43	25	14	39
Wilmington, N. C	46	48	54	60	69	76	79	78	73	63	54	47	62
Winnemucca, Nev	29	33	40	47	54	63	72	71	60	49	38	31	49

[1] The figures cover the 33-year period, 1873 to 1905, inclusive. Those for stations not having that length of record have been corrected accordingly.

PRECIPITATION: NORMAL MONTHLY AND ANNUAL AT SPECIFIED STATIONS.[1]

[Source: The Weather Bureau, Department of Agriculture.]

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Abilene, Tex	0.9	1.1	1.4	2.3	3.7	3.2	2.4	2.0	3.1	2.3	1.2	1.1	24.7
Albany, N. Y	2.6	2.5	2.7	2.4	3.0	3.8	3.9	4.0	3.2	3.0	2.8	2.6	36.4
Amarillo, Tex	.6	.9	.6	1.7	3.7	3.0	3.2	2.8	2.4	1.7	1.2	.8	22.6
Atlanta, Ga	5.3	4.6	5.8	3.6	3.1	3.9	4.7	4.5	3.5	2.3	3.4	4.5	49.4
Bismarck, N. Dak	.5	.5	1.0	1.9	2.5	3.5	2.1	2.0	1.2	1.0	.7	.6	17.6
Boise, Idaho	1.9	1.4	1.4	1.2	1.3	.9	.2	.2	.4	1.3	.9	1.7	12.7
Boston, Mass	3.8	3.4	4.1	3.6	3.5	3.0	3.4	4.0	3.2	3.9	4.1	3.4	43.4
Buffalo, N. Y	3.3	2.8	2.6	2.4	3.1	3.1	3.4	3.0	3.2	3.5	3.4	3.4	37.3
Charlotte, N. C	4.3	4.4	4.6	3.4	3.9	4.5	5.5	5.6	3.2	3.2	2.9	3.9	49.2
Chicago, Ill	2.0	2.2	2.6	2.9	3.4	3.7	3.6	2.9	3.0	2.6	2.5	2.1	33.3
Cleveland, Ohio	2.4	2.6	2.8	2.3	3.2	3.7	3.6	3.2	3.2	2.7	2.8	2.6	35.0
Denver, Colo	.4	.5	1.0	2.2	2.5	1.5	1.6	1.3	.9	1.0	.5	.6	14.0
Des Moines, Iowa	1.2	1.1	1.6	3.0	4.6	5.0	3.9	3.6	3.1	2.7	1.5	1.3	32.4
Dodge, Kans	.5	.7	.9	1.9	3.3	3.3	3.4	2.6	1.8	1.4	.6	.6	20.8
Dubuque, Iowa	1.5	1.4	2.2	2.9	4.3	4.6	4.3	3.0	3.6	2.7	1.8	1.7	34.0
Duluth, Minn	1.0	1.0	1.6	2.1	3.5	4.5	3.6	3.5	3.6	2.7	1.6	1.2	29.9
Eastport, Me	3.8	3.6	4.3	2.9	3.8	3.2	3.4	3.3	3.0	3.8	4.1	4.0	43.3
El Paso, Tex	.5	.5	.4	.2	.4	.6	2.1	1.7	1.4	1.0	.6	.5	9.8
Fresno, Cal	1.6	1.3	1.8	.7	.6	.1	.0	.0	.3	.7	1.0	1.5	9.7
Galveston, Tex	3.6	3.1	2.9	3.1	3.2	4.8	4.0	5.0	5.4	4.2	4.0	3.7	47.1
Green Bay, Wis	1.7	1.6	2.4	2.4	3.6	3.6	3.5	3.1	3.1	2.4	2.0	1.8	31.1
Harrisburg, Pa	2.8	2.7	3.1	2.5	3.7	3.6	3.9	4.2	2.8	3.0	2.4	2.6	37.3
Havre, Mont	.7	.5	.5	1.0	2.1	2.8	1.9	1.3	1.0	.5	.8	.6	13.7
Helena, Mont	.9	.7	.7	1.1	2.0	2.1	1.1	.7	1.1	.8	.7	.8	12.8
Huron, S. Dak	.5	.4	1.0	2.6	2.9	3.8	2.9	2.6	1.7	1.3	.6	.6	21.1
Indianapolis, Ind	2.8	3.1	4.0	3.5	3.9	4.3	4.1	3.3	3.0	2.8	3.5	3.0	41.5
Jacksonville, Fla	3.1	3.4	3.5	2.7	4.2	5.5	6.2	6.2	8.0	5.1	2.2	3.0	53.2
Jupiter, Fla	3.6	3.0	3.1	2.6	4.8	6.9	5.4	5.8	9.6	9.5	3.0	2.9	60.2
Kansas City, Mo.	1.1	1.6	2.8	3.3	5.1	4.7	4.8	4.8	3.8	2.2	1.8	1.4	37.4
Knoxville, Tenn	5.0	4.9	5.6	4.6	3.7	4.2	4.2	4.0	2.8	2.6	3.6	4.2	49.4
Lander, Wyo	.4	.6	1.6	2.5	2.9	1.1	.9	.5	1.0	1.0	.6	.7	13.9
Little Rock, Ark	4.8	4.2	4.9	4.5	5.1	4.1	4.0	3.6	3.3	2.6	4.6	4.2	49.9
Los Angeles, Cal	2.8	2.9	3.0	1.1	.5	.1	.0	.0	.1	.8	1.5	2.9	15.6
Louisville, Ky	3.9	3.8	4.3	4.1	3.6	4.2	3.7	3.5	2.6	2.6	4.2	3.7	44.3
Lynchburg, Va	3.7	3.5	3.8	3.2	4.0	3.9	4.0	4.2	3.6	3.4	2.8	3.3	43.4
Montgomery, Ala	5.1	5.5	6.4	4.2	3.8	4.2	4.7	4.2	2.9	2.4	3.1	4.5	51.2
New Orleans, La	4.6	4.5	5.3	4.9	3.9	6.2	6.5	5.6	4.8	2.9	3.8	4.5	57.4
New York, N. Y	3.8	3.7	4.1	3.3	3.2	3.3	4.5	4.5	3.6	3.7	3.4	3.4	44.6
Northfield, Vt	2.5	2.3	2.8	2.1	2.8	3.2	3.7	3.9	2.8	2.5	2.6	2.7	33.8
North Platte, Nebr	.5	.4	.9	2.2	3.1	3.2	2.7	2.5	1.5	1.2	.4	.5	18.9
Oklahoma, Okla	1.3	1.0	2.4	2.8	5.8	3.1	3.6	3.2	2.8	1.8	2.2	1.7	31.7
Omaha, Nebr	.6	.8	1.4	3.0	4.5	5.0	4.3	3.6	3.0	2.4	1.1	.9	30.7
Oswego, N. Y	3.2	2.6	2.8	2.3	2.8	3.4	3.2	2.7	2.8	3.3	3.4	3.6	36.2
Palestine, Tex	3.9	3.4	3.5	4.1	4.9	4.0	3.0	2.2	3.2	3.6	3.6	3.7	43.0
Parkersburg, W. Va	3.2	3.2	3.8	2.9	3.5	4.6	4.7	3.5	2.7	2.4	2.8	2.8	40.2
Phoenix, Ariz	1.2	.7	.5	.4	(2)	.1	1.1	1.0	1.0	.4	1.0	.6	7.9
Port Huron, Mich	1.9	2.2	2.4	2.1	3.2	3.2	2.7	2.6	2.7	2.7	2.7	2.2	30.6
Portland, Oreg	6.5	5.7	5.2	3.0	2.4	1.8	.5	.6	1.8	3.7	6.5	7.3	45.1
Rapid City, S. Dak	.4	.5	1.0	2.3	2.9	3.6	2.6	2.1	1.3	1.1	.5	.5	18.7
Red Bluff, Cal	3.9	3.6	3.8	1.8	1.3	.5	.0	(2)	.8	1.6	3.2	4.5	25.0
St. Louis, Mo	2.3	2.8	3.4	3.5	4.2	4.5	3.4	2.7	2.9	2.4	2.9	2.2	37.2
St. Paul, Minn	.9	.8	1.6	2.3	3.6	4.4	3.4	3.5	3.4	2.3	1.3	1.1	28.7
Salt Lake City, Utah	1.4	1.4	2.0	2.3	2.0	.8	.5	.8	.8	1.4	1.4	1.3	16.0
San Antonio, Tex	1.7	1.8	1.7	2.9	3.0	3.1	2.2	2.7	2.9	1.5	1.8	1.6	26.8
San Francisco, Cal	4.3	3.7	3.1	1.8	.8	.2	(2)	.0	.3	1.3	2.5	4.2	22.3
Santa Fe, N. Mex	.6	.8	.7	.9	1.1	1.0	2.7	2.4	1.6	1.1	.8	.8	14.5
Sault Ste. Marie, Mich	2.2	1.4	1.8	2.1	3.2	2.8	2.8	3.1	3.5	3.3	2.9	2.3	31.4
Seattle, Wash	4.5	3.9	3.6	2.7	2.3	1.7	.7	.5	1.9	2.9	5.9	6.0	36.6
Shreveport, La.	4.4	3.6	4.5	4.6	4.2	3.6	3.7	2.2	3.2	3.2	4.1	4.4	45.7
Spokane, Wash	2.3	1.9	1.5	1.3	1.6	1.6	.7	.5	1.0	1.5	2.3	2.6	18.8
Springfield, Ill	2.2	2.8	3.1	3.3	4.5	4.3	2.9	2.8	3.4	2.6	2.7	2.4	37.0
Springfield, Mo	2.7	2.3	4.1	3.9	5.6	5.2	4.8	4.3	3.8	2.8	2.6	2.7	44.6
Tampa, Fla	2.8	3.3	2.8	1.8	2.9	8.3	8.4	8.6	7.4	3.0	1.7	2.0	53.1
Vicksburg, Miss	5.7	4.6	6.2	5.2	4.3	4.5	4.4	3.5	3.3	2.8	4.2	5.0	53.7
Walla Walla, Wash	2.0	1.6	1.9	1.7	1.8	1.2	.4	.4	.9	1.5	2.1	2.1	17.7
Washington, D. C	3.4	3.4	3.8	3.2	3.8	4.2	4.6	4.4	3.6	3.1	2.7	3.2	43.5
Williston, N. Dak.	.6	.5	.7	1.2	2.3	3.6	2.0	1.3	.9	.8	.6	.7	15.1
Wilmington, N. C	3.5	3.4	3.6	2.9	4.0	5.6	7.0	6.5	5.3	3.7	2.4	3.1	51.0
Winnemucca, Nev	1.0	.9	1.0	.9	1.0	.6	.2	.2	.3	.5	.7	1.0	8.4

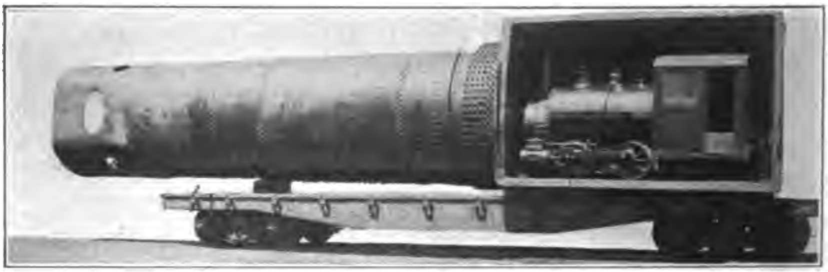
[1] The figures represent inches and cover the 36-year period, 1871 to 1906, inclusive. Stations not having that length of record have been corrected accordingly.
[2] Indicates trace of precipitation.

WHEN STARS ARE ADDED TO OUR FLAG.

We have met the opinion that a star was added immediately upon the proclamation of the President that a State was admitted to the Union. To make certain of the fact we referred the question to the Librarian of the War Department and have received from him a reference to the law upon the subject. It is found in U. S. Statutes at Large, 3:415, act of April 4, 1818, and enacts that the star for a new state shall be added to the flag upon the fourth of July succeeding the admission of the state. In accordance with this law two stars have been added to the flag on July 4, 1912, making 48 stars. They have been placed in six rows of eight stars each. The last states to be admitted to the Union were Arizona and New Mexico. Their Statehood bill was signed by the President on August 21, 1911, subject to certain changes in their constitutions. The proclamation of the President has been made admitting these states and their stars became part of the flag on July 4, 1912.

DIMENSIONS OF PRINCIPAL DOMES.

	Diameter.	Height.
Pantheon, Rome, Italy	142 ft.	143 ft.
Cathedral, Florence	139 "	310 "
St. Peter's, Rome	139 "	330 "
Capitol, Washington, U. S. A.	124¾ "	307½ "
St. Sophia, Constantinople	115 ft.	201 ft.
Baths of Caracalla, (Ancient Rome)	112 "	116 "
St. Paul's, London	112 "	215 "



BOILER OF MOST POWERFUL LOCOMOTIVE IN THE WORLD.

This locomotive can haul 155 loaded 50-ton capacity freight cars at 10 miles per hour. It has 16 driving wheels. Locomotive and tender weigh 752,000 pounds. The firebox is large enough to hold a Dinkey switching locomotive. Built for the Virginian Ry. Co.

THE ROOSEVELT DAM.

CHAPTER IV.

MACHINE ELEMENTS AND MECHANICAL MOVEMENTS

MACHINE ELEMENTS

The Machine Elements or Powers are the Lever and the Inclined Plane. Every machine when analyzed is found to be made up of these elements, either singly or in combination; for example, pulleys, gear wheels, etc., are forms of levers, while screws, cams, etc., are forms of inclined planes.

There are four distinct types of levers, as shown in our illustration.

1st. The Common Lever, consisting of a straight inflexible bar movable on a fulcrum. The section of the bar extending from the fulcrum to the point where the power is applied is called the Power Arm, and the section extending from the fulcrum to the point where the weight is applied is called the Weight Arm.

2d. The Angular or Bell Crank Lever. This is distinguished from the Common Lever in having its power arms disposed at an angle to the weight arms.

3d. The Wheel and Axle, or Revolving Lever. A wheel and axle or two concentric wheels take the place of the power and weight arms. The weight is attached to a rope coiled on one of the wheels, and the power is attached to a rope coiled on the other wheel. The relation of this lever to the common lever is indicated by the dotted lines, and it will be evident that this relation remains constant even when the wheels are revolving.

4th. The Pulley. Another type of revolving lever, but differing from the wheel and axle type in that a single wheel is used and the fulcrum is not necessarily always at the center of the wheel.

Each of these types of the simple lever is capable of three different arrangements usually termed "Orders." In the First Order the fulcrum lies between the weight and the power. In the Second Order the weight lies between the fulcrum and the power. In the Third Order the power lies between the fulcrum and the weight. The second order gives the longest power arm relative to the weight arm, and consequently is the most powerful lever of the three. The formulæ for determining the amount of power required to balance a given weight, are given at the bottom of the illustration. In measuring the arms of the angular levers the measurements should not be taken along the length of the arms, but in the horizontal plane as shown, because this measurement represents the true theoretical length of the lever arm. As the lever is moved about the fulcrum, the ratio of the power arm to the weight arm changes as indicated by dotted lines in the first order of angular levers, because the arm that is approaching the horizontal plane is increasing in length, while the other which is moving toward the vertical plane is decreasing in length. The same is true in a modified form of the second and third orders of angular levers.

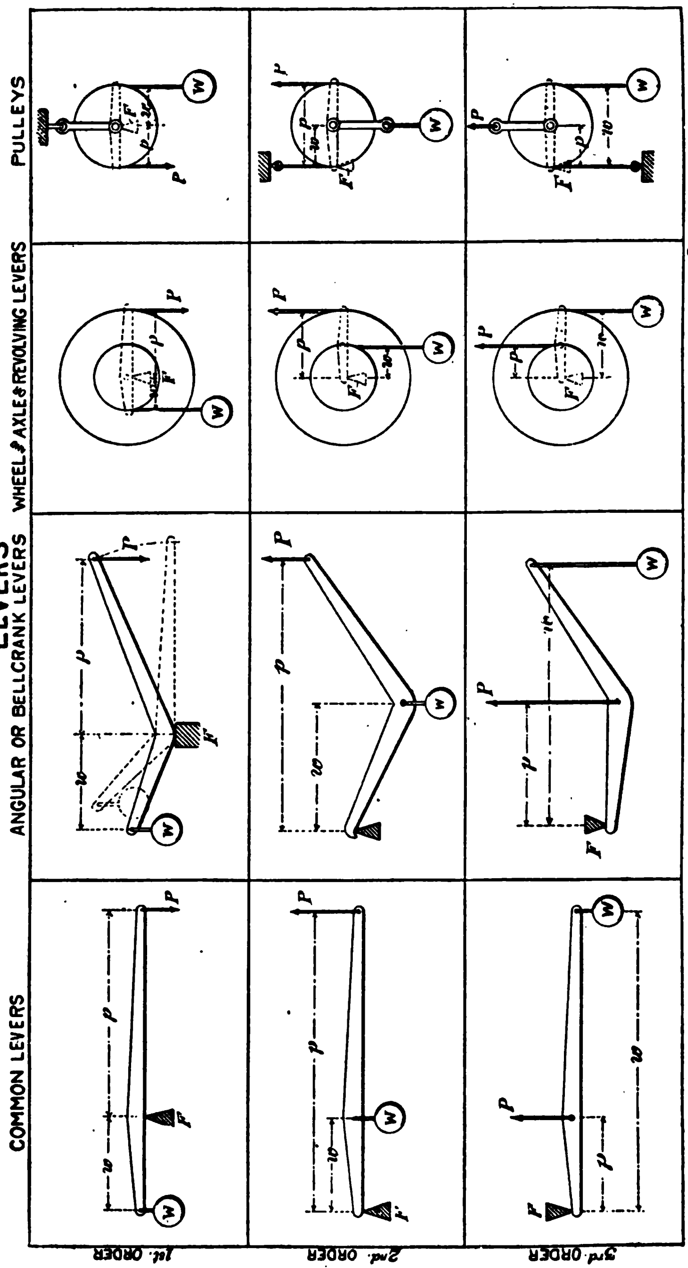
In the case of the pulleys the power and weight arms bear a definite relation to each other. No matter what their size may be, the power arm will always be of the same length as the weight arm in pulleys of the first order, consequently the power must be equal to the weight in order to keep the lever in equilibrium. In pulleys of the second order the power arm will be twice the length of the weight arm, consequently the power must be equal to half of the weight in order to keep the lever in equilibrium; and in pulleys of the third order the power arm will be half the length of the weight arm, consequently the power must equal twice the weight in order to maintain the equilibrium of the lever.

The compound levers consist of two or more simple levers of the same or different orders coupled together, either for the purposes of convenience or to increase the power.

Of the two compound common levers illustrated, Figure 1 shows two common levers of the first order coupled together, and Figure 2 represents a common lever of the first order coupled to a common lever of the second order.

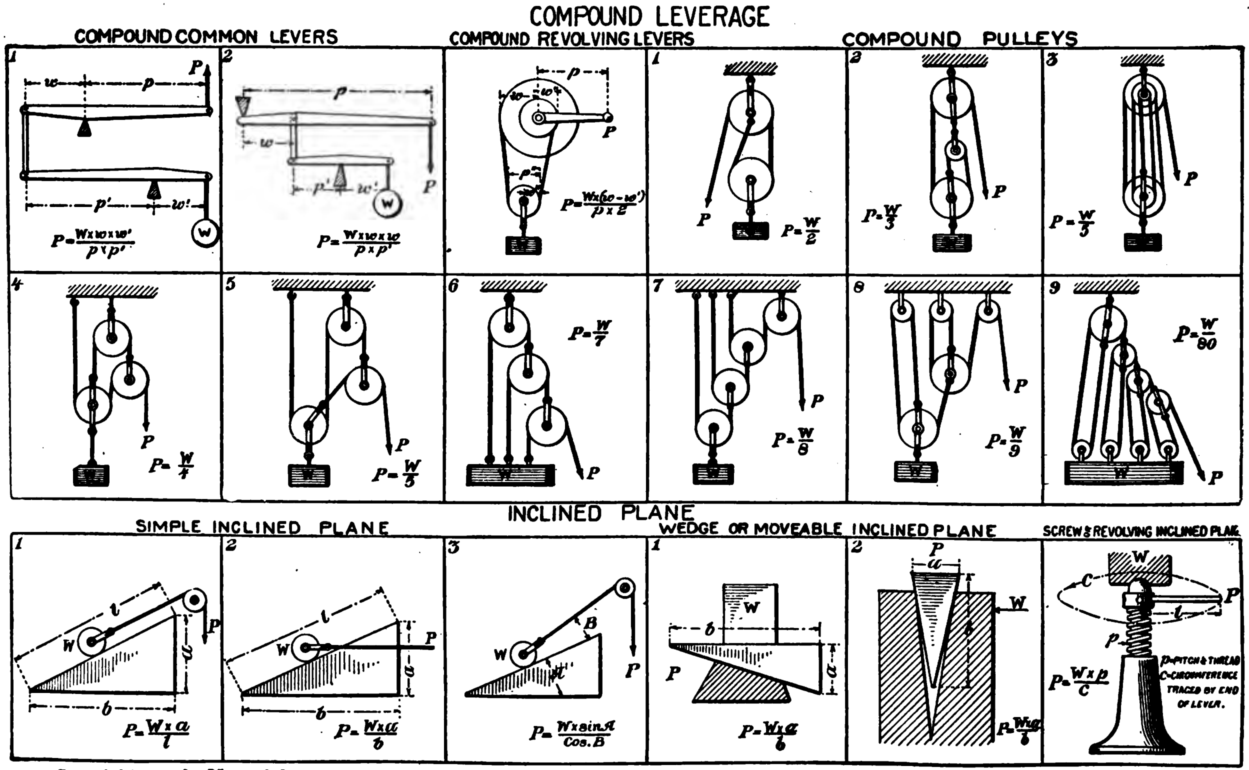
The compound revolving lever illustrated is a combination of a wheel and axle of the second order, operating a pulley of the second order. This compound lever is also called a "Chinese windlass," owing to its early use by the Chinese for lifting heavy weights, such as draw-bridges. etc.

The compound pulleys or tackle shown are various combinations of pulleys of the same or different orders. As in the case of the simple pulleys, the weight and power arms bear a constant relation to each other, and it is therefore possible to give the numerical value of the power in terms of the weight, or *vice versa*, afforded by the different types of tackle, regardless of the size of the individual pulleys they comprise. The following simple formula is applicable to all tackle in which a continuous length of rope is used, as in Figures 1, 2, and 3: *Power equals weight divided by the number of rope parts supporting the weight.* In Figure 3, for instance, there are five such parts, not counting of course the part on which the power is applied. Figures 4 to 9 are all rather complex, owing to the fact that the power is transmitted to the weight through one or more movable pulley blocks connected by separate ropes. Figures 4 and 5 show tackle arrangements called Spanish burtons. A general formula, applicable to any number of pulleys arranged as in Fig. 6, is $P = \frac{W}{2^p - 1}$,



P=POWER W=WEIGHT F=FULCRUM p=POWER ARM AND w=WEIGHT ARM $P=\frac{W \times w}{p}$ AND $W=\frac{P \times p}{w}$

MACHINE ELEMENTS I.



MACHINE ELEMENTS II.

in which P represents the power, W the weight, and n the number of ropes used. The general formula for the arrangement shown in Figure 7 is $P=\frac{W}{2^n}$. The general formula for the arrangement shown in Figure 8 is $P=\frac{W}{3^n}$. The general formula for the arrangement shown in Figure 9 is $P=\frac{W}{3^n-1}$.

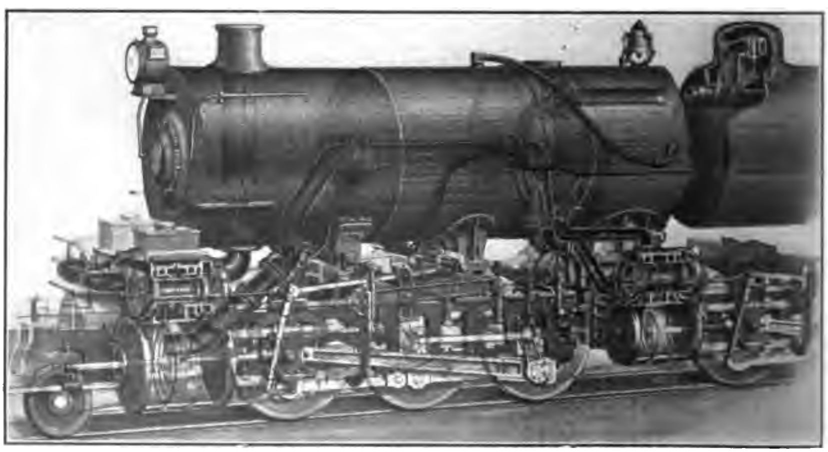
There are three general classes of inclined planes, the simple inclined plane, the wedge or movable inclined plane, and the screw or revolving inclined plane. There are three general types of simple inclined planes, as illustrated. 1st. That in which the power acts in a direction parallel with the inclined face of the inclined plane. 2d. That in which the power acts parallel with the base of the inclined plane. 3d. That in which the power acts at an angle both to the face and to the base of the inclined plane. The formulæ for determining the mechanical advantage secured by the different forms of inclined planes are given in the illustration. In the third type of inclined plane the relation of power to weight changes as the weight is drawn up the plane, owing to the fact that the angle B becomes gradually larger.

There are two types of wedges, the single wedge and the double wedge. The latter is the more common type.

Under revolving inclined planes we have the screw together with the cam (not illustrated here), which are more commonly used in machinery than any other type of inclined plane.

MALLET ARTICULATED LOCOMOTIVE FOR THE VIRGINIAN RY. CO.

This is a fine type of locomotive. It develops a tractive force of 97,200 pounds, and is capable of hauling a train of twenty cars, weighing 78 tons each, with a caboose, up a compensated grade of two and seven hundredths per cent. The boiler is of the separable type with a feed-water heater in the front section. This locomotive is capable of traversing 23° curves.



PIPING ARRANGEMENT OF BALDWIN MALLET LOCOMOTIVE.

Note flue leading through feed-water heater.

MECHANICAL MOVEMENTS

TOOTHED GEAR.

1. Spur Gears.—The ordinary form of toothed-wheel. The smaller of two intermeshing gear-wheels whether a spur- or bevel-wheel is called a Pinion.

2. Gear with Mortised Teeth.—This is what is ordinarily known as a Cog-wheel among machinists. The wheel is ordinarily made of iron and the teeth of wood.

3. Step Gear.—The face of this gear is divided into sections with the teeth of the different sections arranged in steps; that is, one in advance of the other. Step gear-wheels are useful in heavy machinery, as they give a practically continuous bearing between the intermeshing teeth of the gear-wheels.

4. Oblique Toothed Gear.—The teeth are cut diagonally across the working face of the wheel so as to give the gear-wheel a side thrust. In a double oblique toothed-gear, usually called a V-toothed gear, the thrust in one direction, is neutralized by an equal thrust in the opposite direction. As in the stepped-gear it gives a continuous bearing of the teeth.

5. Internal, or Annular Gear.—The teeth are formed on the inner periphery of a ring. This type of gear is used in heavy machinery, because it offers a greater hold for the teeth of the driving pinion. There is less sliding friction between the teeth than in the usual outside spur-gear and pinion.

6. Star Wheel Gears.—The teeth are so formed as to permit an appreciable separation of the gear-wheels without preventing them from properly meshing one with the other. These gears are used on wringing machines, etc.

7. Elliptical Gears.—Due to their elliptical form, while the driving-gear rotates at constant speed, the other gear will be rotated at a variable speed. That is, its motion will first be accelerated and then retarded. They are used in some machines to produce a slow powerful stroke followed by a quick return.

8. Angular Gears.—These gears have a rectangular form and, as in the elliptical gears, they serve to transform uniform rotary movement into variable rotary movement. However, this movement is more jerky than that produced by elliptical gears. Angular gears are very seldom used.

9. Lantern Gear.—The teeth consist of pins which lie parallel with the axis of the gear-wheel, and are secured at their ends in two disks or gear heads. The pins are so spaced as to mesh with the teeth of a spur-gear. The lantern-gear permits limited sliding movement of the spur-gear along its axis. It can be very cheaply made, but is used chiefly for light work, such as clock mechanism, etc.

10. Crown Gear.—The teeth project perpendicularly from a side face of the wheel instead of lying in the plane of the wheel. When in mesh with the teeth of a spur-gear or a lantern-gear, it forms a cheap method of transmitting power from one shaft to another lying at right angles thereto. Crown gears are useful for light work, and were common in old clock mechanisms. They used to be known as *Contrate* wheels.

11. Bevel Gears.—The ordinary gear for transmitting power from one shaft to another at an angle thereto. When the wheels are of the same size and operate on shafts, lying at an angle of 45 degrees, one with the other, they are called Miter gears.

12. Worm or Screw Gear.—An endless screw engages a spur-gear with spirally disposed teeth. The screw is called a worm, and the spur-gear a worm-wheel. A much diminished but very powerful motion is communicated from the worm to the worm-wheel. It is used in heavy machinery.

13. Curved Worm Gear.—The working face of the worm is curved so that a number of teeth will be in mesh with the worm-wheel, thus giving greater strength. It is a difficult matter to cut the thread of this worm correctly owing to its varying pitch. The gear is called the saw-tooth gear when the teeth and thread are V-shaped, as illustrated.

14. Spiral or Helical Gears.—The teeth are spirally disposed on the working faces of the wheels so that they will transmit motion to shafts lying at right angles one with the other.

15. Skew Gears.—The gears rotate on shafts which lie in different planes and at an angle with each other. The drawing shows a skew spur-gear meshing with a bevel-gear. The same term would apply to two bevel gears lying in different planes and at angles to each other.

16. Rack and Pinion.—A spur-gear engages a toothed bar. Rectilinear motion is by this mechanism transformed to rotary motion or vice versa. It is quite common in heavy machinery to find a worm meshing with and driving a rack.

17. Spherical or Globoid Gear.—A spiral thread is cut on a spherical body and meshes with the spiral teeth of the spur pinion. The latter is so mounted that it may be swung to different positions on the spherical gear, without varying its speed of rotation.

18. Gear with Roller Teeth.—The teeth project from the flat face of the wheel, and consist of pins carrying rollers. This construction is used to reduce friction.

19. Pin Wheel.—The flat face of the gear is studded with pins which are adapted to

mesh with slots formed in the edge of a pinion. The pinion is so mounted that it can be moved toward or from the center of the pin wheel to vary its speed of rotation. When the pinion is moved past the center of the pin wheel its direction of rotation is reversed.

20. Spiral Hoop Gear.—A spiral thread is formed on the flat face of the wheel and this meshes with a worm-wheel. The latter is moved forward one tooth at each complete rotation of the spiral hoop. This gives a powerful drive, though, of course, at a greatly diminished speed.

21. Intermittent Gear or Geneva Stop.—The driving-wheel is provided with a single tooth adapted to engage one of a series of notches in the other wheel. At each complete rotation of the driving-wheel the other wheel is moved forward one notch but no more, due to the concave space between the notches which fits closely against the circumference of the other wheel. In the Geneva stop one of these spaces is formed with a convex outline, as illustrated. When this space is reached both wheels are prevented from further rotation forward. The Geneva stop is used on watches to prevent winding up the main spring too tightly.

22. Intermittent Bevel Gear or Mutilated Gear.—The teeth are formed only at intervals on the face of the gears. The space between the teeth in the driving-gear is convex, and that between the teeth in the other gear is concave, so that when the teeth are not in mesh with each other these convex and concave portions fit into each other and prevent the driven gear from moving forward under its own momentum.

23. Variable Gears.—The gear wheels are made up of gear sectors of different radial length, which produce suddenly varying motions of the driven gear due to the varying leverage between the wheels. The segments are arranged on different planes so as not to interfere one with the other.

24. Scroll Gears.—The gears have a scroll form which produces a gradually increasing or decreasing speed during each rotation. These gears are also called cam gears.

25. Elliptical Bevel Gears.—They produce variable motion of a shaft lying at right angles to the driving shaft. This gear is used on bicycles to give increased power on the downstroke of the pedal and a quick movement on the return.

26. Variable Pin Wheel.—A cone is provided with pins arranged spirally thereon, and these mesh with teeth formed on the other cone. When one cone is rotated at a constant speed the other moves with a gradually increasing or decreasing speed during each rotation.

27. Cam-toothed Pinion.—The pinion consists of two oppositely disposed heart-shaped teeth, mounted side by side, on a shaft. The gear-wheel with which they mesh has teeth alternately arranged on opposite side faces. Due to the form of the pinion teeth, the gear-wheel is locked after being moved forward by one tooth until the other tooth comes into mesh with a tooth on the other face of the wheel.

28. Bevel Scroll Gear.—The gear-wheel consists of a bevel spiral scroll which meshes with a bevel pinion. As the spiral scroll rotates it causes the pinion to slide forward on its shaft, and thus varies its speed.

FRICTION GEAR.

29. Flat-faced Friction Gear.—A common type of friction gear. The wheels are usually faced with rubber or leather to increase the frictional hold between the wheels. One of the wheels is journaled in bearings which can be adjusted toward the other wheel so as to increase the frictional engagement.

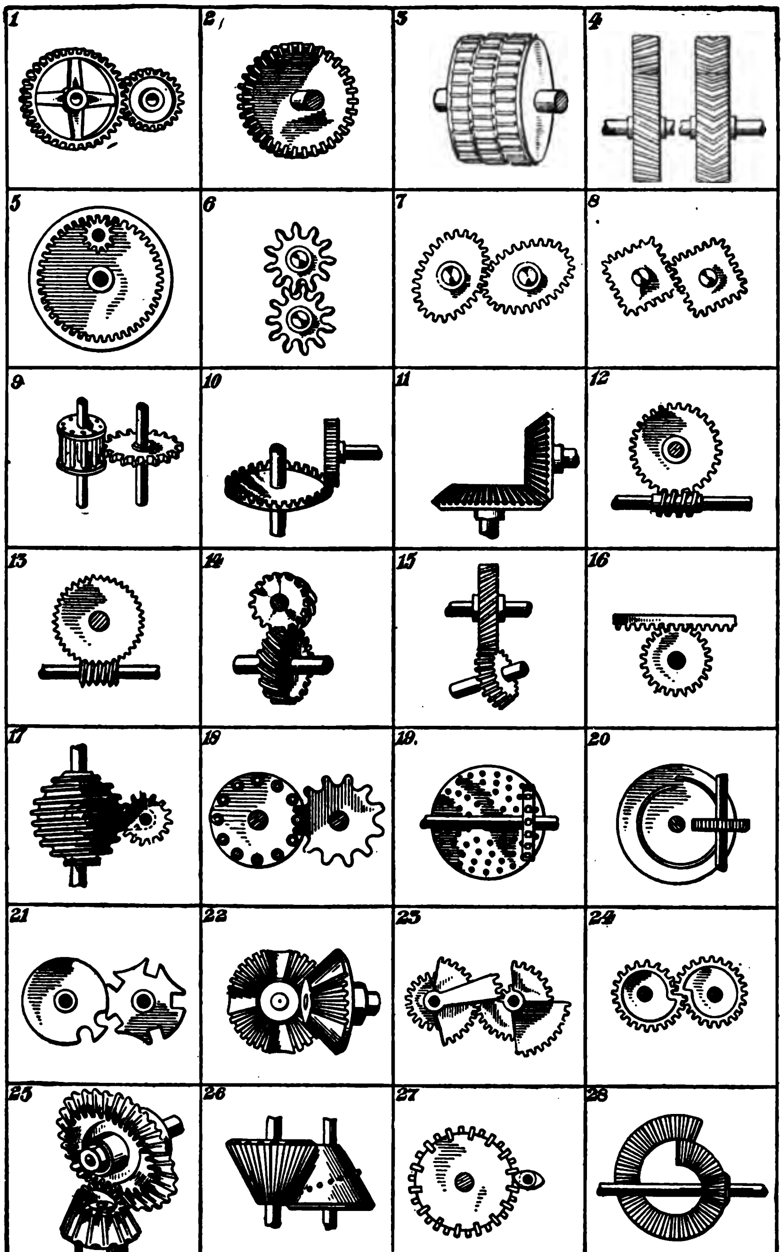
30. Grooved Friction Gear.—The faces of the wheels are grooved so as to increase the bearing surface. The best results are obtained by pressing the wheels but slightly into engagement with each other, as this produces little loss of power by friction.

31. Adjustable Friction Pinion.—The pinion is formed of a disk of rubber or other flexible material held between two washers. When these washers are tightened together they press out the rubber between them, crowding it into closer contact with the V-groove of the gear with which it engages.

32. Beveled Friction Gear.—Two cone frustums are used to convey motion from one shaft to another at right angles thereto.

33. Friction Drums.—The drums have concave faces which permit them to transmit motion one to the other while lying at an acute angle with each other.

34 to 40. Variable Speed Friction Gear.—34, a pinion, engages the flat face of the friction disk. Variable motion is produced by moving the pinion across the face of the disk. When the center of the disk is reached no motion is transmitted. Beyond the center the direction of motion transmitted is reversed. 35. Motion is transmitted from one friction disk to another lying parallel, but not in alignment therewith, through an intermediary pinion. This pinion can be moved vertically to engage different points on the friction disks, and thus produce any desired variation in the speed transmitted. 36. Two convex friction disks are so arranged that one may be swung through an angle bringing different points on its surface into contact with the face of the other disk. In this manner the speed of the motion transmitted is varied. This gear is used on sewing-machines. 37. Two parallel friction disks are each provided with an annular concavity. Motion is transmitted from one disk to the other by a friction pinion mounted between the disks, and so arranged that it can be rotated to engage different points on the surfaces of the concavities, thereby varying the speed transmitted. 38. A cone with concave face is engaged by a pinion which may be swung about a center to engage different points on the face of the cone. 39. Two cones with concave faces are mounted on shafts running at right angles to each other. Motion is transmitted from one cone to the other through a friction pinion mounted to swivel so as to engage different points on the faces of the cones. 40. Two friction cones are mounted on parallel shafts, and between them runs a friction pinion having two faces, one engaging the upper cone and the other engaging the lower cone. This provides a broad bearing surface. The pinion may be moved to different positions along the faces of the cones, and thereby produce changes in the speed.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CHAIN GEAR.

41. SPROCKET WHEEL.—The wheel is provided with teeth adapted to fit in between the links of a chain. The chain may be of the ordinary oval welded link type or of the flat riveted type used on bicycles.

42. LINK-BELT WHEEL.—The chain is made up of square links which are engaged by ratchet-shaped teeth on the chain wheel.

43. POCKET WHEEL.—The wheel is formed with pockets into which the links of the chain are adapted to fit.

44. SIDE-TOOTHED WHEEL.—The wheel is formed with two sets of teeth between which the chain travels. The teeth bear against the ends of the outer links of the chain.

45. SIDE AND CENTER TOOTHED CHAIN WHEEL.—This wheel is similar to that shown in Fig. 44, but has in addition a row of teeth along the center which bear against the center link of the chain.

46. TOOTHED-LINK CHAIN AND WHEEL.—The links are formed with projecting teeth which fit into notches on the rim of the chain wheel.

47. "SILENT" CHAIN AND WHEEL.—This is a special type of chain in which each link is formed with a tooth at each end. The teeth of adjacent links coact to completely fill the spaces between the teeth of the chain wheel. The construction is such as to produce a noiseless operation of the chain gear even at high speeds.

48. DETACHABLE TOOTHED-LINK BELT AND WHEEL.—Each link is formed with a tooth, which meshes with the teeth of the chain wheel. The construction of each link is such that it may be readily slipped into or out of engagement with the next link of the chain.

ROPE GEAR.

49. V-PULLEY.—The ordinary type of pulley for round ropes or cables. Owing to the V-shaped construction of the pulley groove, the rope wedges tightly into engagement with the pulley.

50. PULLEY WITH FLEXIBLE FILLING.—In order to secure frictional engagement of the cable with this pulley, the pulley groove is provided with rubber, leather, wooden, or other filling.

51. PULLEY WITH RIBBED GROOVE.—In this construction of pulley the required grip is produced by forming ribs in the bottom of a pulley groove.

52. PULLEY WITH GRIPPING LUGS.—The flanges of this pulley are formed with lugs which kink the rope or cable as shown, thus producing the required grip.

53. ROPE SPROCKET-WHEEL.—An old form of rope gear used in hoists and the like.

54 and 55. GRIPPING PULLEYS.—Gripping arms are provided which grip the cable at the point where the cable presses into the pulley. In 54 the gripping arms are wedged inward by the side walls of the pulley groove when pressed downward by the cable. These arms are normally h ld up by coil springs. In 55 the cable is gripped by the toggle movement of hinged clips placed at intervals along the periphery of the pulley.

56. CABLE SPROCKET-WHEEL.—The cable is provided with clamps which enter sockets formed in the cable wheel. This is a form of cable gear commonly used at present in elevating and conveying machinery.

CLUTCHES.

57. COMMON JAW CLUTCH.—One member of the clutch is mounted to slide on a feathered shaft, and the other member which is connected with the machinery is normally stationary on this shaft. When the slidable member is moved forward the teeth on its forward edge intermesh with the teeth of the other member, setting the machinery in motion. The slidable member is moved forward by means of a forked lever which is hinged to a split collar mounted loosely between flanges on the clutch member.

58. CLAW CLUTCH.—The slidable member of the clutch consists of a body portion with two claw arms which, when moved forward, are adapted to engage opposite sides of a bar on the other member of the clutch.

59. LEVER CLUTCH.—The slidable member is provided with a lever loosely hinged to its forward end. The other member of the clutch consists of a disk formed with ratchet teeth on its face. These are engaged by the hinged arm when the shaft rotates in one direction, but the arm moves freely over them when rotated in the opposite direction.

60. KNEE AND ROSE CLUTCH.—A crank arm is attached to the slidable member of the clutch, and engages a pin on an arm loosely hinged to the opposite member of the clutch.

61. RATCHET CLUTCH.—The clutch members are formed with ratchet teeth, so that when the motion of the driving shaft is reversed, the members will be disengaged.

62. PIN CLUTCH.—The slidable member is provided with radial arms formed with pins at their outer ends which are adapted to enter sockets formed along the periphery of a disk on the opposite member of the clutch.

63. FRICTION DISK CLUTCH.—The two clutch members are each formed with disks preferably faced with rubber or leather, so that when pressed together their frictional engagement will cause a transmission of motion from the rotating disk to the other.

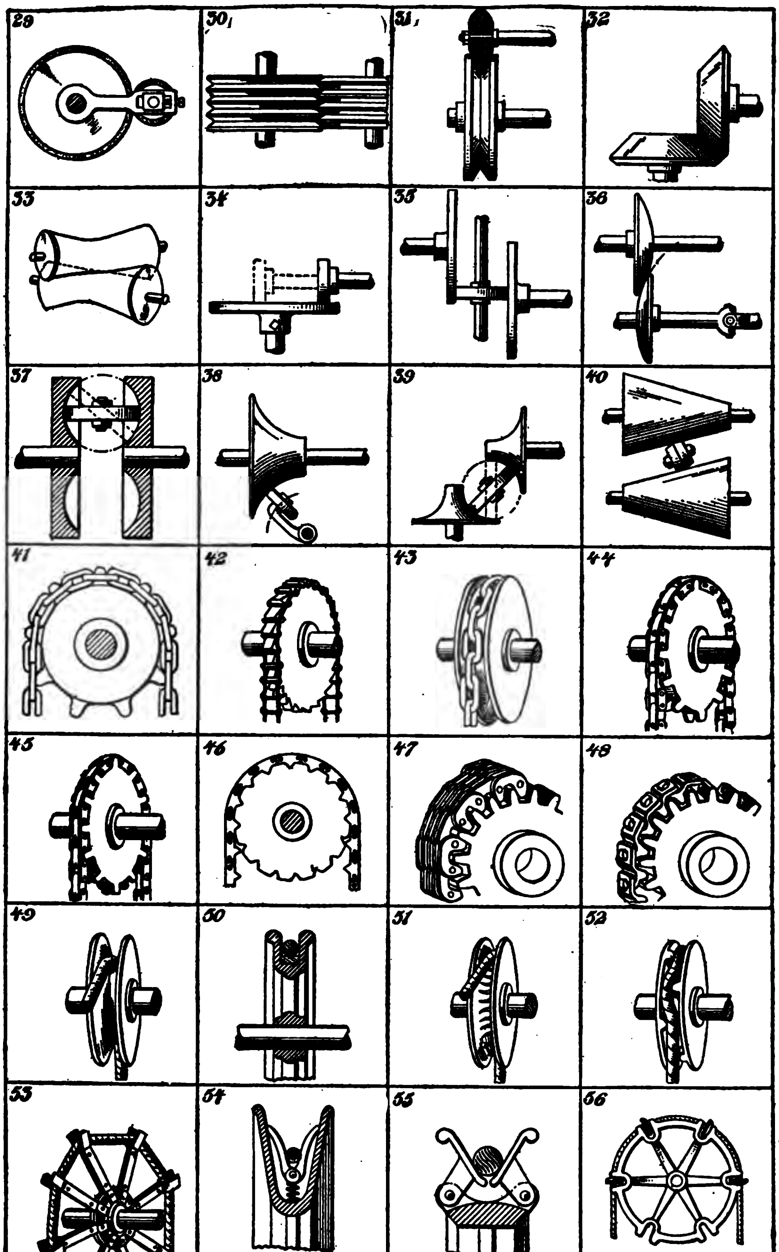
64. FRICTION GROOVE CLUTCH.—One of the clutch members is formed with a groove in its face to receive the lip of the other member which is cup-shaped. Both the lip and the side walls of the groove are slightly tapered to insure a close fit, even after the parts have been partly worn away by friction.

65. STUD CLUTCH.—Engagement between the two members of the clutch is effected by means of a stud on each disk adapted to enter a notch formed in the periphery of the opposing disk.

66. FRICTION BAND CLUTCH.—One member of the clutch consists of a pulley provided with a steel band which encircles and fits tightly on its periphery. The other member of the clutch consists of a lever provided with pins at its outer ends, which are adapted to engage the steel band. Since this band is not fastened to the pulley, any shock due to suddenly throwing the clutch members into engagement will be taken up by the steel band slipping on the face of the pulley.

67. FRICTION CONE CLUTCH.—The clutch is made up of two cones, one adapted to fit into the other. The frictional engagement causes one to drive the other.

68. SELF-RELEASING CLUTCH.—The clutch disks are provided with inclined teeth, so that in case the resistance to the driven shaft in-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creases beyond a certain degree, the clutch members will automatically move apart.

69. CAM CLUTCH.—One of the members is cup shaped, and within this the other member operates. The latter comprises a number of cam-shaped arms hinged to a body portion, and so arranged that when moved in one direction they will bind against the inner wall of the drum, but when moved in the opposite direction they will be automatically disengaged therefrom.

70. V-GROOVED CLUTCH.—The clutch disks are formed with annular V-grooves adapted to fit into each other, and thus increase the friction surface of the clutch members.

71. EXPANSION CLUTCH.—The slidable member is provided with a number of movable ring segments connected by radial arms to the main body of the clutch and adapted to bear against the inner surface of the drum or cup which constitutes the other member of the clutch. When the slidable member is moved forward, by reason of the toggle action of the radial arms, the segments are brought into frictional engagement with the other member of the clutch.

72. COIL-GRIP CLUTCH.—The movable member of the clutch is formed with a number of coils of steel in which there is a central conical opening. This is moved over the cone which constitutes the opposite member of the clutch, producing the required frictional engagement of the two members.

ANGLE SHAFT COUPLINGS AND UNIVERSAL JOINTS.

73. CRANK AND HINGED-PIN COUPLING.—A coupling for shafts which lie at an angle to each other. One shaft carries a hinged pin which fits into an opening in the outer end of a crank arm carried by the other shaft.

74. DOUBLE-SLEEVE ANGLE COUPLING.—Each shaft carries a crank arm provided with a pin at its outer end, which lies parallel with its respective shaft. The two pins enter a coupling device consisting of two sleeves integrally formed, but lying at an angle with each other which corresponds to the angle formed by the shafts. Through this double-sleeve coupling, motion is transmitted from one shaft to the other, the pins sliding back and forth in the sleeve openings.

75. CROSS-BAR ANGLE COUPLING.—This is used for coupling two parallel but offset shafts. Each shaft carries a yoke piece provided with sleeves at its outer ends. The coupling member is a cross-shaped piece, its arms fitting into the sleeves of the yoke pieces, and permitting the necessary lateral play as the shaft rotates. This form of coupling is also applicable to shafts which lie at an angle with each other.

76. PIN AND SLOT COUPLING.—A crank pin carried by one shaft engages a slot in a crank arm carried by the other shaft. The motion transmitted is variable, due to the fact that the leverage varies as the pin moves up and down in the slot.

77. RING-GIMBAL UNIVERSAL JOINT.—The ends of the shafts are provided with yoke members whose arms are pivoted to a ring-gimbal, the pivot pins of the two yoke pieces lying at right angles to each other. This coupling will communicate motion at any angle under 45 degs. For angles of over 45 degs. a double-link universal joint is used.

78. DOUBLE-LINK UNIVERSAL JOINT.—A link forked at each end is hinged to two rings, which are mounted in the yoke pieces on the ends of the shafts. In place of rings cross pieces such as shown in the illustration are often used.

79. HOOKE'S ANGULAR COUPLING.—The shafts are connected by two double links which are arranged in the form of a parallelogram. Intermediate of the shafts the links are connected with ball-and-socket joints.

80. BALL-AND-SOCKET UNIVERSAL JOINT.—Socket pieces are secured to the ends of the shafts, and these are provided with metal bands which encircle the ball that constitutes the coupling member. The bands enter grooves in the ball which lie at right angles to each other.

81. "ALMOND" ANGULAR COUPLING.—A side view of the coupling is shown at 1 and a plan view at 2. Between the shafts to be coupled is a fixed stud on which a bell crank is mounted to turn. The bell crank is permitted to slide axially on the stud. The bell crank is connected at the ends by ball-and-socket joints with links attached to the ends of the shafts. Now, as the power shaft rotates, rotary motion will be communicated to the other shaft through the bell crank, which will rock and also slide axially on the stud.

82. FLEXIBLE SHAFT.—Two shafts are connected by a flexible shaft consisting of a coil spring, or a metal tube in which a helical saw-slot has been cut. This flexible shaft will permit transmission of motion through a wide angular range.

83. LINKED FLEXIBLE SHAFT.—The flexible shaft is made up of a series of links coupled together with universal joints. A coil spring fits loosely over the links and prevents them from kinking. This spring in turn is covered with a flexible tube. The shaft will transmit motion about almost any curve or angle. It can be used for heavy work.

84. RIGHT-ANGLE COUPLING.—The ends of the shafts are formed with heads in which are drilled a number of sockets. A series of rods, each bent to form a right angle, enter these slots and form the coupling links between the shafts. As the shafts rotate these rods slide in and out of their sockets.

RATCHET MOVEMENTS.

85. The teeth of a ratchet wheel are engaged by a pawl hinged to a rocking arm. The ratchet wheel is rotated only on the forward stroke of the arm.

86. A rocking lever carries two pawls; one on each side of its fulcrum. The wheel is rotated both by the downward and the return stroke of the lever; for while one pawl is rotating the wheel, the other swings to position to take a new hold on the ratchet wheel. The rotation of the ratchet wheel is thus kept nearly constant.

87. A ratchet crown-wheel or rag-wheel is engaged by pawls depending from two arms loosely pivoted on the axle of the ratchet-wheel. These two arms are connected by links to a common power arm. Rectilinear reciprocating movement of the latter in the line of the arrow produces an almost constant rotation of the ratchet-wheel.

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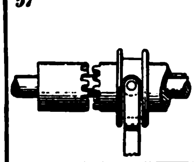
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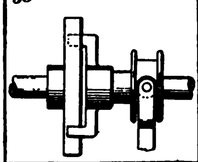
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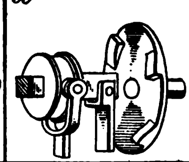
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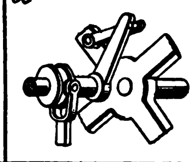
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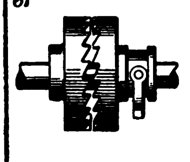
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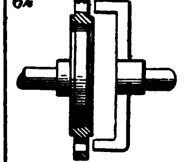
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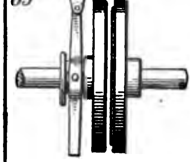
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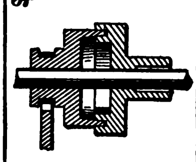
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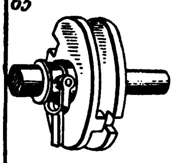
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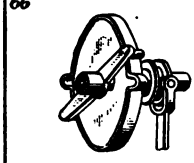
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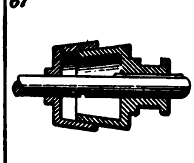
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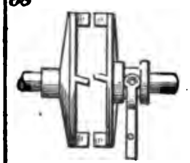
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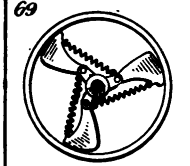
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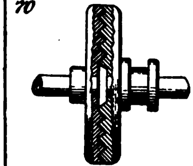
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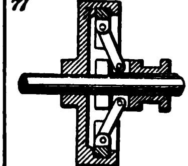
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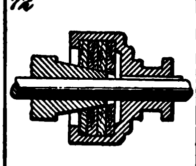
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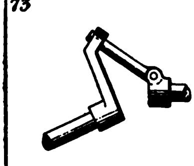
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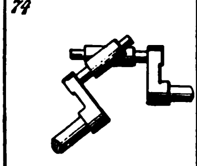
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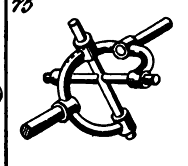
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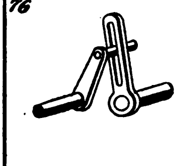
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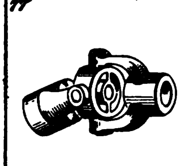
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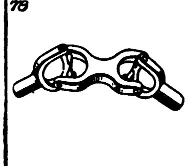
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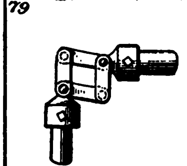
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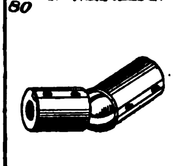
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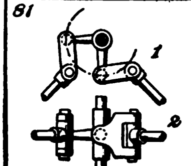

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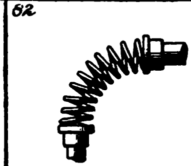
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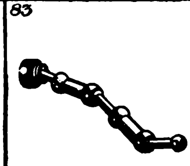
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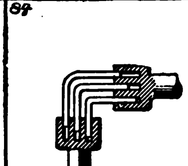


88. The action of this ratchet mechanism is very similar to that shown in Fig. 86, except that the pawls are hooked and ratchet-wheel is rotated by an alternating pulling rather than pushing action of the pawls.

89. This is a modification of the principle pictured in Fig. 88, and shows a rocking lever with two pawls hinged thereon engaging a ratchet rack.

90. Another modification of the principle shown in 88. The rocking lever is mounted on a fixed stud and is provided at the center with a pin which enters a slot in a ratchet bar. The latter is formed with ratchet teeth on its opposite edges which are engaged by hooked pawls pivoted on the rocking lever. These pawls are crossed, as shown, so that they will be kept by gravity in constant engagement with the ratchet teeth. Now, when the lever is rocked the pawls will alternately act to lift the ratchet bar.

91. A common construction used for rotating a ratchet-wheel against a spring resistance. A dog mounted on a fixed pivot drops by gravity or by spring pressure against the ratchet teeth and holds the wheel from turning while the pawl is being swung back for a fresh hold on the ratchet-wheel.

92. This shows the method of rotating an ordinary spur gear-wheel by means of a pawl. The pawl is provided with a tooth at its outer end which fits between the teeth of the gear. The pawl is hinged to the lower arm of the bell-crank lever mounted on the gear shaft. The operating lever also mounted on this shaft is permitted a certain amount of play between two pins on the shorter arm of the bell crank-lever. A rod connects the operating lever with the pawl. When the lever is raised it first lifts the pawl out of engagement with the gear, then, coming in contact with the upper pin on the bell crank-lever, it moves the pawl and bell crank back to the desired position. On lowering the operating lever the pawl is first brought into engagement with the gear and then the lower pin on the bell crank is encountered, and the gear is caused to rotate. This arrangement prevents wearing away of the teeth—a common defect in the ordinary type of ratchet mechanism.

93. The pawl is kept in contact with the ratchet-wheel by the weight of the lever on which it is formed. By pulling the rope attached to the end of the lever the pawl will be drawn out of engagement with the ratchet-wheel, and the latter will be turned by friction of the rope on the wheel hub.

94. A reversible spur-gear ratchet mechanism. Mounted on the shaft which carries the spur-gear is a bell crank-lever. This at one end carries a double-toothed pawl, one of which teeth meshes with the teeth of the gear. The pawl is so shaped that it will withdraw the tooth from engagement with the gear teeth on the return stroke of the lever. When it is desired to reverse the direction of rotation, the pawl is moved over to the position shown in dotted lines, bringing its other tooth into engagement with the gear teeth.

95. The ratchet-wheel is intermittently rotated by the oscillation of a lever which carries a spring-pressed pawl. On the upward stroke the ratchet is turned by the pawl which is backed by a shoulder on the lever. On the return stroke a dog holds the ratchet-wheel from turning while the pawl snaps past.

96. Ratchet teeth are formed on a ball which rests in a socket formed at the end of a lever. A spring pawl on this lever engages the ratchet teeth at any position of the lever. This construction is useful for ratchet braces which have to be operated in inconvenient places.

97. A device for converting rotary motion into vibratory motion. A spring-pressed pin engages the teeth of a revolving crown-wheel ratchet, and is thereby caused to vibrate.

98. A device for converting reciprocating motion into intermittent rotary motion. The crown-wheel ratchet is intermittently rotated by a reciprocating lever carrying a pawl which engages the ratchet teeth.

99. Internal ratchet used on ratchet braces, etc. The drill spindle carries a number of spring-pressed pawls which bear against the internal ratchet teeth formed in the handle of the brace.

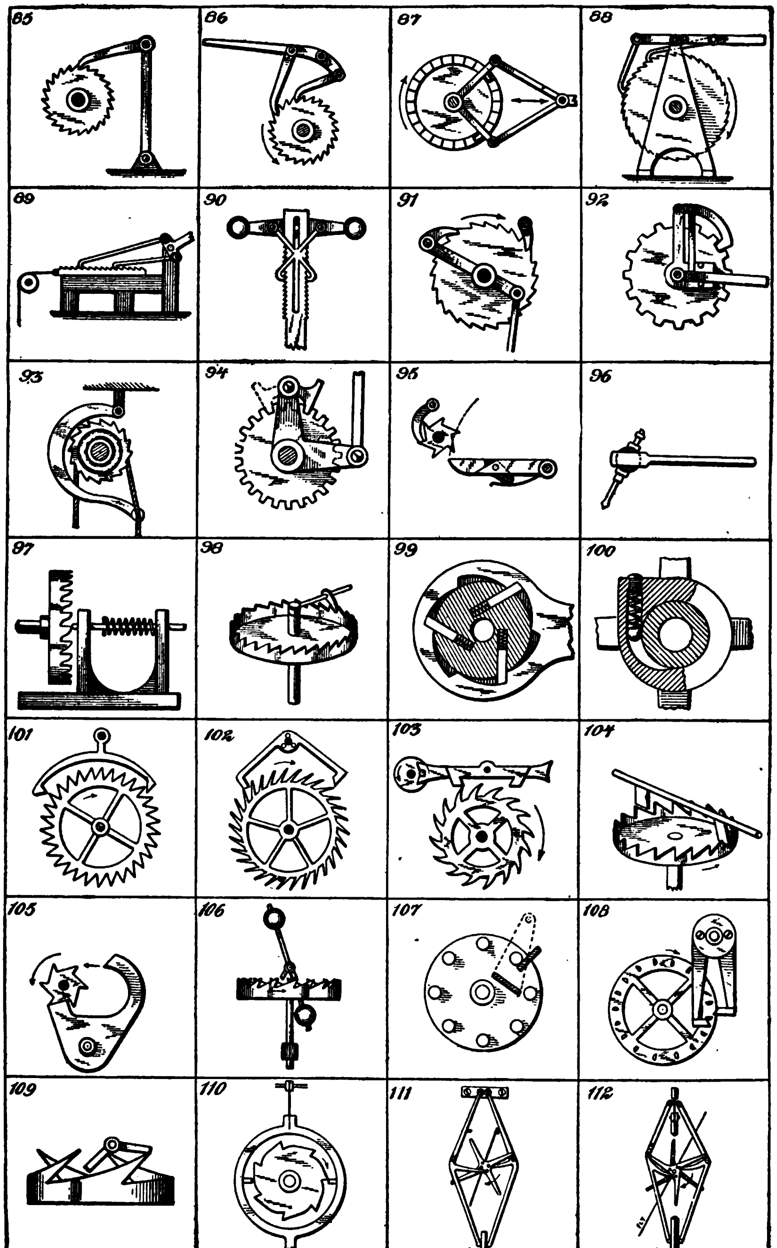
100. Ball ratchet device for lawn mowers, etc. In the hub of a wheel is a groove in which a ball is carried. A spring presses this ball down against a shaft on which the wheel turns. When the wheel rotates forward, the ball wedges in between the shaft and the groove, causing the shaft to turn with the wheel. When the direction of rotation is reversed, the ball is forced up against the spring, releasing the shaft.

ESCAPEMENTS.

101. Recoil Escapement.—This is a common form of escapement used on clocks. The pallets carried by the pendulum are so mounted that when a tooth of the escape wheel, which is driven by the clock-train, is just escaping from one of the pallets, another tooth falls on the other pallet near its point. As the pendulum swings on, however, the taper face of the pallet bearing against the tooth causes the escape wheel to turn slightly backward. As the pendulum swings back, it receives an impulse from the escape wheel which is greater by reason of this recoil. The principal value of the recoil, however, is to overcome any unevenness in the pressure exerted by the train, which might otherwise stop the clock.

102. Dead-beat Escapement.—A form of escapement used on the best clocks. The teeth of the escape wheel fall "dead" upon the pallets, that is, the pallets are so cut that as the pendulum continues to swing they slide on the teeth without turning the escape wheel backward. The ends of the pallets are formed with inclined faces, termed "impulse faces," against which the teeth of the escape wheel bear when giving impulse to the pendulum. The value of this escapement lies in the fact that it gives a very even beat of the pendulum even when there is a slight variation in the force exerted by the clock train.

103. Lever Escapement.—This is an escapement used on watches. The anchor on which the pallets are carried is secured to a lever, formed with a notch in one end. This notch is engaged by a pin on the arbor of the balance wheel. The teeth of the escape wheel alternately bear against the inclined faces of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the pallets and oscillate the lever, which turns the balance wheel alternately in opposite directions.

104. VERGE ESCAPEMENT.—A form of escapement used in old-fashioned watches. The escape wheel is a crown wheel, and its teeth, on opposite sides, are engaged by two pallets, carried on the shaft of the balance wheel. The escapement teeth, acting alternately on the pallets, lift and clear them, thus rocking the shaft and balance wheel, which governs the frequency of the escape.

105. STAR WHEEL ESCAPEMENT.—The escape has but few teeth and is, therefore, called a star wheel. The pallets act on teeth that lie diametrically opposite each other. This escapement has a dead-beat action.

106. CROWN TOOTH ESCAPEMENT.—An old form of recoil escapement, in which a crown escape wheel is used. The pallets are mounted to engage opposite sides of the wheel. This type is objectionable, owing to the fact that the pendulum must oscillate through a very wide angle in order to permit the teeth to escape from the pallets, which requires a greater pressure in the clock-train and heavier parts and produces greater friction on the pallets.

107. LANTERN WHEEL ESCAPEMENT.—An old-fashioned type of escapement, in which the escape wheel is a lantern wheel, and the pallets are two plates set at angles on a rocking arm.

108. PIN-WHEEL ESCAPEMENT.—A dead-beat escapement used in many of the best turret clocks. The escape wheel is formed with pins which drop on to the "dead" faces of the pallets, but give impulses to the pendulum by sliding off the inclined "impulse" faces of the pallets. It is found best in practice to cut the "dead" faces so as to give a very slight recoil.

109. OLD-FASHIONED CROWN WHEEL ESCAPEMENT.—This, in appearance, is quite similar to the escapement shown in Figure 106, but is different in action. The inclined faces of the teeth, which are very long, act to lift the pallets.

110. RING ESCAPEMENT.—A form of "dead-beat" escapement. The pallets are formed on the inside of the ring, within which the escape wheel turns.

111 and 112. GRAVITY ESCAPEMENTS.—A type of escapement in which the impulse from the escape wheel is not given directly to the pendulum, but through the medium of two weights, usually the arms on which the pallets are carried and which are alternately lifted by the escape wheel and dropped against the pendulum. Figure 111 shows the four-legged gravity escapement used on turret clocks. The escape wheel is formed with four legs or teeth, and carries eight pins, four on one face of the hub and four on the other. The pallet arms are pivoted as near as possible to the point from which the pendulum swings. The pallets which are formed on these arms are arranged to lie one on one side and the other on the other side of the escape wheel. The pallet arms are each provided with a stop piece against which the teeth of the escapement will alternately rest. In the illustration, a tooth of the escape wheel is resting against the stop on the right-hand arm. As the pendulum swings toward the right, the tooth will escape from the stop, permitting the wheel to rotate until it encounters the stop on the left-hand arm, at the same time a pin on the wheel engages the end of the pallet at the left, and lifts the pallet arm. In the meantime the right-hand pallet arm swings with the pendulum to the end of its stroke, but falls with it on the return stroke until stopped by a pin on the escape wheel. It will be evident that the angle through which the pallet arm falls with the pendulum is greater than that through which it is lifted by the pendulum, and it is this difference in travel which gives impulse to the pendulum. Figure 112 shows a double, three-legged escapement which is used for very large clocks. Two three-legged escape wheels are used with three lifting pins held between them like the pins of a lantern wheel. The pallets operate between the wheels. A stop piece is placed on one of the pallet arms for the forward wheel, and the other arm carries a stop for the rear wheel. The teeth of one wheel are set 60 degrees in advance of the other. The action is similar to that of the four-legged escapement. A tooth of the forward wheel is shown resting on its stop. When this is released by the swinging pendulum, the wheels rotate, lifting the left-hand pallet until a tooth of the rear wheel engages its stop. The right pallet arm, however, continues to be lifted by the pendulum, and then falls with it, giving it impulse until arrested by a lifting pin, only to be lifted again when the pendulum releases the rear wheel from its stop.

GEARING.

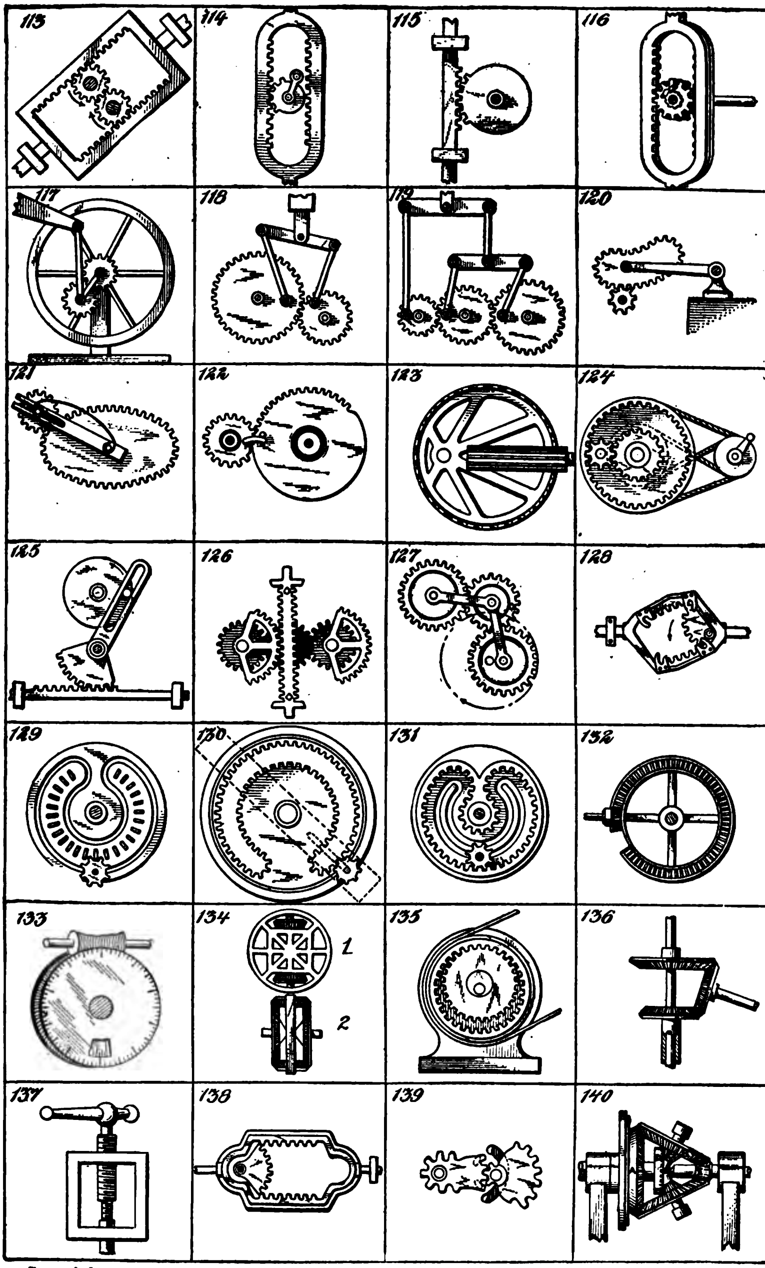
113. A means for changing rectilinear reciprocating motion to rotary reciprocating motion and vice versa. Two intermeshing pinions engage internal racks formed on opposite sides of a frame.

114. Means for changing rotary motion to rectilinear reciprocating motion. A rotating sector or pinion formed with teeth on only a portion of its periphery imparts reciprocating motion to a rack frame by first engaging the teeth at one side of the rack, and then the teeth on the other side of the rack. See Figure 115 for gravity return.

115. Another method of converting rotary motion into rectilinear reciprocating motion. A rotating sector engages the teeth of a rack during a part of its rotation and thereby lifts the rack, but as soon as the rack clears the sector teeth, it drops by gravity, ready to be lifted up when it again encounters the teeth of the sector. See Figure 114 for power return.

116 A movement designed as a substitute for a crank. The rack frame is formed with internal racks on opposite sides, but these racks lie in different planes. Two separate pinions are employed which mesh respectively with these racks. The pinions are mounted loosely on a shaft, but carry pawls which engage with ratchet wheels secured to the shaft. On the forward stroke of the rack frame the pinions will both be rotated but in opposite directions. However, due to their ratchet and pawl connection with the shaft, only one pinion turns the shaft. On the return stroke the rotation of the pinions will be reversed but the shaft will continue to rotate in the same direction, driven this time by the other pinion of the pair.

117. Sun and Planet gearing. A gear wheel, called the "sun" wheel, rotating on a fixed center, is engaged by a gear wheel called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the planet wheel, which revolves about the sun wheel. This construction was used by James Watt in one of his steam engines as a substitute for a crank. The planet wheel was rigidly secured to the connecting rod and connected by an arm to the center of the sun wheel. At each complete revolution of the planet wheel about the sun wheel, the latter was caused to rotate twice.

118 and 119. Means for converting rotary motion into irregular reciprocal motion. In 118 two intermeshing spur gears are provided with crank arms connected by a working beam. If the gears are of equal size the motion transmitted to the rod secured to the working beam will be uniform. If, however, the gears are of different sizes, the motion of this rod will vary greatly. In 119 a still more complex movement is produced, since there are three intermeshing gear wheels of unequal sizes and two connected working beams.

120. Irregular oscillatory motion is given to a hinged arm by pivoting at its outer end a cam-shaped gear wheel which is rotated by a continuously driven pinion. Any desired motion of the arm may be produced by varying the shape of the cam gear.

121. Means for converting uniform rotary motion into variable rotary motion. An elliptical gear rotates at uniform speed and drives a spur pinion. The latter is secured to a shaft which slides between the arms of two forked levers. A spring keeps the pinion in mesh with the elliptical gear.

122. Means for converting constant rotary motion into intermittent rotary motion. The driving wheel is formed with teeth through a portion of its periphery equal to the toothed periphery of the pinion. The latter is cut away at one place to fit the plane portion of the driving wheel. This prevents the pinion from rotating until a pin on the wheel strikes a projecting arm on the pinion and guides the teeth of the gears into mesh with each other.

123. Means for converting uniform rotary motion into variable rotary motion. A crown wheel eccentrically mounted is driven by a pinion rotating at uniform speed. The point of engagement of the crown wheel with the pinion varies radially, causing the wheel to rotate at a variable speed.

124. The mechanism is so arranged as to impart planetary movement to a pinion. An internal gear wheel formed with a pulley groove in its periphery is mounted to rotate on a sleeve which carries a spur gear at one end and a pulley at the other. The gear wheels are belted to a driving pulley in such manner as to rotate in opposite directions. A spur pinion which fits in between the teeth of the two gears is rotated thereby on its own axis and revolves about the center of the two gears at a speed which is the differential of the speeds of the two gears.

125. The construction here shown is adapted to produce a slow forward movement of a rack with a quick return. The rack is mounted to slide longitudinally and is driven by a toothed sector. The latter is provided with a slotted arm which is engaged by a pin on a rotating disk. The forward movement will take place while the pin is passing through the larger arc subtended by the two dotted radial lines shown, and there turn while the pin is passing through the smaller arc.

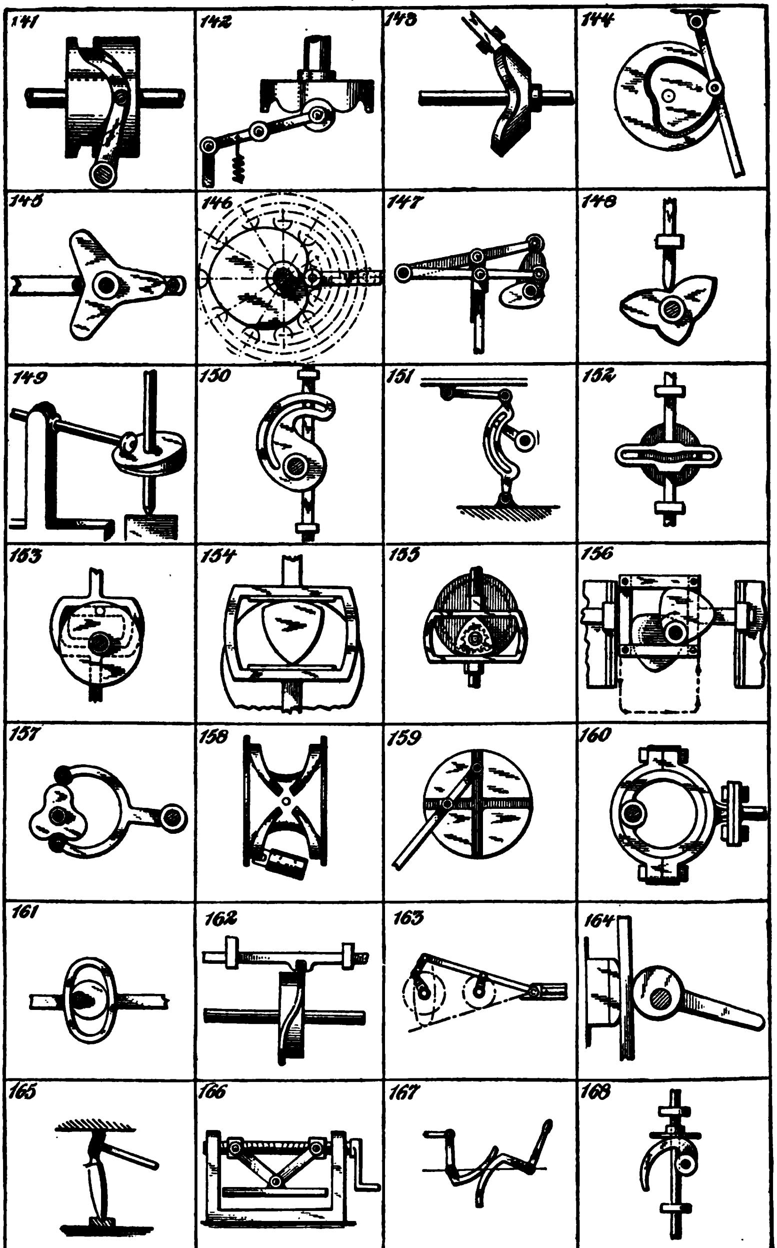
126. A means for converting reciprocating motion into continuous rotary motion. A double-faced reciprocating rack engages first one and then the other of a pair of toothed sectors. The sectors are mounted on a pair of shafts, disposed on opposite sides of the rack. The shafts carry pinions which engage opposite sides of the central gear wheel. The rotary motion alternately imparted to the sectors, is conveyed through these pinions to the gear wheel, each pinion alternately acting to drive the wheel when its respective sector is in mesh with the rack, and then to be driven by the gear wheel until its sector is brought again in mesh with the rack. Thus a continuous rotary motion is produced.

127 Mechanism for converting uniform rotary motion into irregular rotary motion. Mounted eccentrically on the driving shaft is a gear wheel which transmits motion to another gear wheel through an intermediate pinion. Pivoted to the centers of the two gear wheels are two links whose outer ends are connected by a hinge pin on which the pinion rotates These links serve to hold the pinion constantly in mesh with the gears, no matter what the position of the eccentric is.

128. Means for converting uniform rotary motion into variable reciprocating motion. A rack frame mounted to slide longitudinally is driven by an eccentric-toothed sector. The racks are placed at an angle with the line of movement and are provided with jaws at each end adapted to mesh with pins projecting above the face of the sector. As the sector rotates it transmits a gradually accelerated longitudinal movement to the rack frame until the outer pin engages the jaw at the end of the rack. The rack frame is then driven by this pin until the opposite rack is engaged by the sector teeth.

129 to 132. Mangle Gears.—So-called because of their use on mangle machines. 129. The larger wheel is formed with a cam groove which guides the pinion. The shaft of the latter is ordinarily provided with a universal joint, which permits it to move vertically and thus keep in mesh with the crown teeth formed on the large wheel. The pinion meshes first with the outer and then with the inner ends of the teeth on the larger gear, driving the latter first in one direction and then in the other. 130 shows another form of the same movement. The pinion moves radially in the slot shown in dotted lines, and engages first the outer and then the inner line of teeth on the mangle wheel, causing the latter to rotate first in one direction and then in the other. 131. The mangle wheel is formed with an internal gear, and the pinion is guided by a cam groove. This construction and that shown in Figure 130 produce uniform motion through an almost complete rotation, and this is followed by a quick return due to the smaller radius of the inner circle of teeth. 132. In this construction, as in that of Figure 129, the same speed is maintained in both directions of rotation. The mangle wheel in Figure 132 is formed with teeth on both faces; the pinion first engages the teeth on one face of the wheel, and then passing through the opening engages the teeth on the opposite face, thus reversing the direction of rotation.

133 to 137. Differential Gear.—133. Two worm wheels, one of which has more teeth than the other, engage a single worm. Suppose that one wheel has 100 teeth and the other has 101; then at every complete rota-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tion of the latter wheel it will be one tooth behind the former wheel, and at the end of 100 rotations the former would have made a complete rotation relative to the latter. If the worm be cut with a single thread it would have to make 100 times 101, or 10,100 rotations in order to produce this result. This construction is used on certain counting devices. 134. Two bevel gears are connected by a pair of small bevel pinions mounted in a frame, as shown in the side elevation 1. If the gear wheels should be rotated at different velocities the frame would rotate at the mean velocity. 135. A rapidly rotating shaft carries a gear wheel eccentrically mounted thereon. The latter is carried along into engagement with a fixed internal gear or rack, and is thereby rotated at a slow speed. 136. Two concentrically mounted bevel gears of different diameters engage with a third bevel gear. The latter rotates at the mean of the velocities of the other two. 137. A hollow screw threaded into a frame is formed with an internal thread, of slightly different pitch, adapted to receive a smaller screw, which is so mounted in the frame that it may slide longitudinally, but cannot rotate. If the larger screw should have ten threads to the inch, and the smaller screw eleven, the latter would move outward one-eleventh part of an inch while the former was fed inward an inch.

138. Uniform rotary motion converted into reciprocating rectilinear motion. A rack frame arranged to slide longitudinally is engaged by a toothed sector which meshes with the teeth on one side of the rack to drive the frame forward, and then with the teeth on the other side to drive the frame back.

139. Variable speed gear for producing fast and slow motion. It comprises two pairs of toothed sectors so arranged as to properly mesh with each other. The driving gear shown at the right is provided with two arms which carry studs at their outer ends. These studs lie below the lower face of the gears and engage studs formed on the lower face of the driven gear, as shown in dotted lines, thus guiding the wheels after one pair of sectors have moved out of mesh and before the other pair have come into mesh with each other.

140. Mechanism for producing increased or decreased speed on the same line of shafting. A fixed bevel gear wheel, *A*, meshes with two bevel gear wheels, *B*, which in turn mesh with a pinion, *E*, carried on the right-hand shaft. The bevel wheels, *B*, are mounted in a bracket which turns freely on the shaft of pinion, *E*. Each wheel, *B*, carries a pinion, *C*, which meshes with a bevel gear wheel, *D*, carried by the left-hand shaft. The change of speed from one shaft to the other is due to the planetary movement of the wheels, *B* and *C*. When the multiple of the teeth in *A* and *C* exceeds that of *B* and *D* the shafts will rotate in opposite directions.

CAMS AND CAM MOVEMENTS.

141 and 142. Cylinder or Drum Cams.—In Figure 141 a groove is formed in the curved face of a cylinder or drum. A roller on the end of a pivoted arm fits into this groove. As the drum rotates the arm will be swung to various positions, guided by the groove in the cam. In Figure 142 the roller bears against the rim of the cylinder, which is made of such shape as to give the desired motion to the lever. In this form of cam, while the roller is positively moved down by the cam rim, it is raised up by a spring on the lever, which tends to hold it constantly against the cam. In the first type of cam the motion is positive in both directions.

143. Beveled Cam.—This form of cam is used to give motion to a lever whose axis lies at an angle with the cam-shaft. The cam is of conical form with curved edges against which the lever bears. In our illustration we have shown a sliding rod in place of a rocking lever. The conical face, it will readily be seen, must lie parallel with the plane of the rod.

144. Face Cam.—The cam groove is cut in the face of a disk, and this on being rotated guides the movement of the rocking lever which carries a roller that enters this groove.

145. Clover-leaf Cam.—This is a form of disk cam which gives a positive drive to a sliding lever. The cam acts between two rollers on the lever, and is so cut as to exactly fill the space between these rollers at all times.

146. Heart Cam.—Another form of disk cam. This is so cut as to give uniform rectilinear motion to a sliding rod which bears against its edge. To lay out this cam, divide the desired line of travel of the rod into any convenient number of equal spaces, starting from the center of the roller, and from the center of the cam describe arcs passing through the dividing points. Twice the number of radial lines should be laid off from the center of the cam, the lines being equally spaced angularly. The successive points of intersection of the radial lines and the arcs will then mark the centers for a series of arcs with radii equivalent to the radius of the roller. The curve drawn tangent to these arcs will then mark the outline of the cam.

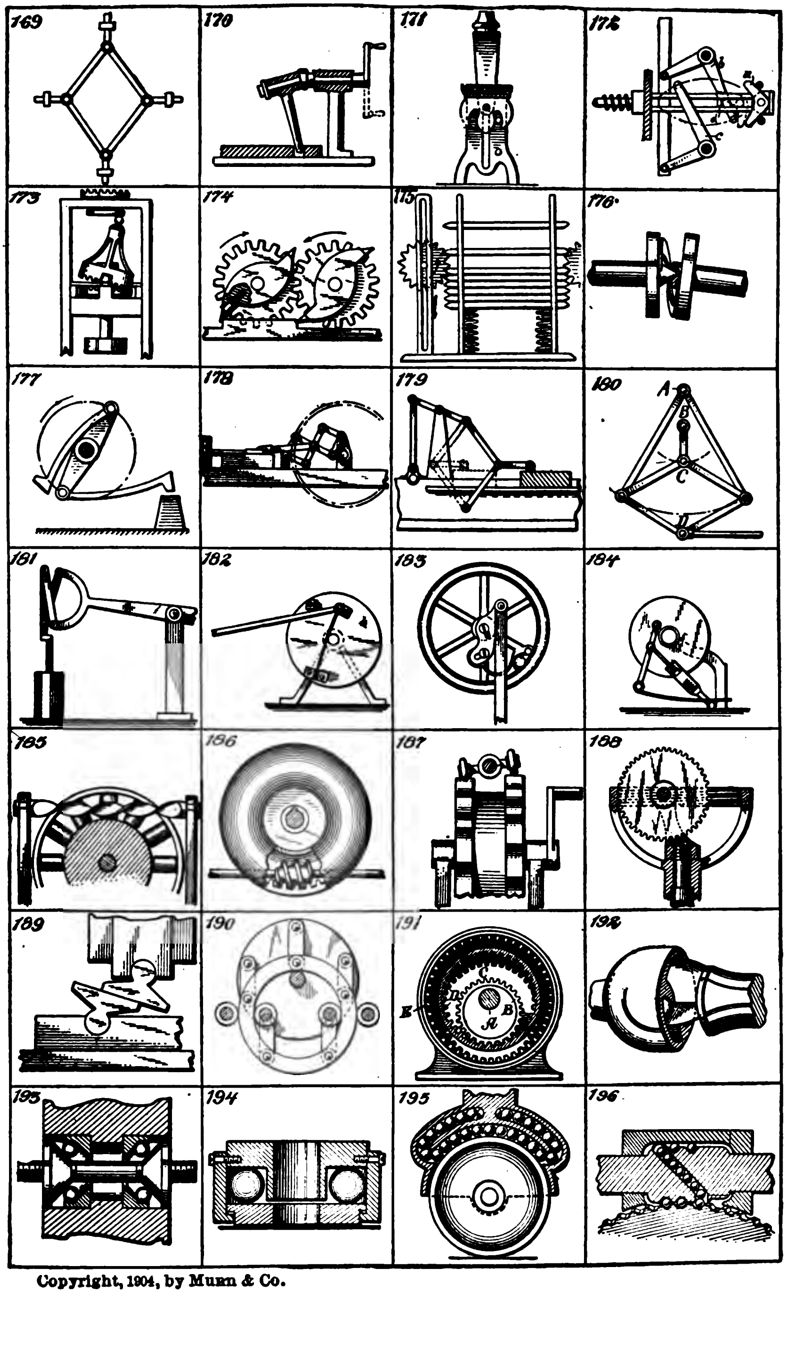
147. Means are here shown for converting rotary motion into alternating reciprocating motion of two rods. The rods are attached to pivoted levers carrying rollers which bear against the edges of two oval disk cams mounted on a rotating shaft.

148. Rotary motion is here converted into variable rectilinear motion. The end of a sliding lever rests on the irregular edge of a disk cam, and is there by caused to move up and down following the irregularities of the cam. The cam shown gives three reciprocations of the rod for each rotation of the cam shaft.

149. Means for converting rotary motion of a shaft into rocking motion of a lever. The lever is caused to rock by a cam with an oblique face on which the roller of the lever bears. This is a modification of the motion shown in Figure 142.

150. Means for converting rocking motion of a shaft into uniform rectilinear motion of a rod. The rod, which is mounted to slide in bearings, carries a pin which engages a slot in the cam on the rocking shaft. The cam slot is so cut as to give uniform motion to the rod.

151. Continuous rotary motion of a shaft is here converted into intermittent reciprocating motion of a slide. A cam lever hinged at its lower end to a fixed point is connected by a rod at its upper end, to the slide. A crank arm on the rotating shaft carries a pin which enters a curved slot in the cam lever. The crank arm causes the lever to rock, carrying the slide with it. The cam slot should form an arc with a radius equal to that of the crank arm, so that while the crank pin is passing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through this arc the slide will remain stationary. This motion is used on certain types of sewing machines and printing presses.

152. The type of cam used on the needle bars of some sewing machines. A pin on a rotating disk engages a slot in a cam yoke on the needle bar. This slot is formed with a curve at one place, which holds the bar stationary, while the pin is passing through it. This causes the needle to stop while the shuttle passes.

153. This cam motion differs from that of Figure 152, in that it causes the sliding bar to stop midway of its upward stroke and midway of its downward stroke. The cam slot comprises two parallel sections connected by two curved sections. While the pin on the rotating disk passes through the curved sections the bar is held stationary.

154. The cam here shown causes the sliding bar to stop at the end of each stroke. The cam is triangular, with curved faces, and rotates between the two parallel working faces of a cam frame on the sliding bar. While the outer face of the cam engages the frame the bar is held stationary. This is a form of cam motion used in place of an eccentric for operating the valve of a certain French engine.

155. A peculiar variable intermittent motion of the sliding rod is given by the planetary action of a cam mounted on a rotating disk. The cam shaft passes through the disk and carries a pinion which meshes with a stationary internal gear wheel.

156. A rectangular motion is imparted to the cam frame by two triangular curved cams mounted on a rotating shaft. The frame is mounted to slide laterally in bearings, which in turn are permitted to slide vertically in grooves on two stationary supports. The frame is made up of two horizontal rails on which one of the cams acts, and two vertical rails on which the other cam acts The illustration shows the frame about to be moved downward by the forward cam acting on the lower rail while the rear cam prevents any lateral movement. On the next quarter rotation of the cam shafts a lateral movement will ensue, due to the rear cam acting on the right-hand vertical rail. At the same time the forward cam will hold the frame against vertical movement. During the third quarter of the rotation the frame will be lifted, and during the last quarter it will be moved back laterally to the position illustrated. If the cams are both of the same size, the motion of the frame will trace a perfect square.

157. Means for converting rotary motion into vibrating motion. A forked lever engages opposite edges of a disk cam, and is thereby caused to vibrate. This cam, as that in Figure 145, is so cut that its opposite edges are everywhere equidistant when measured through the center. For this reason it is obvious that such a cam must always be cut with an odd number of projections.

158. A recently patented mechanism for imparting power to the dasher shaft of a churn. A rocking movement is imparted to the shaft from a rotating cam. At the upper end of the shaft is a forked piece or follower mounted to turn in a socket at right angles to the axis of the shaft. The follower engages a spline on the cam and is thereby guided first to one side, and then to the other of the cam, rocking the shaft on its axis.

159. Trammel Gear.—A reciprocating movement of the rod is produced by the rotation of a shaft, and *vice versa*. Pivoted to the rod are two blocks which slide respectively in two slots in the face of the disk which cross each other at right angles. This movement was patented seventy years ago, but is constantly being reinvented as a substitute for the crank.

160. Mechanism for converting rotary motion into reciprocating motion. This is a common form of eccentric used on steam engines, etc., for communicating a reciprocating motion to the valves from the crank shaft. The rod is provided with a circular strap which is bolted over a disk or ring eccentrically mounted on the crank shaft.

161. This form of eccentric is similar to that shown in Figure 160, but an oval cam frame or yoke is used in place of a circular strap, so as to produce a rectilinear reciprocating movement of the rod. This form of eccentric acts directly on the valve rod which travels between fixed guides.

162. Spiral Cam for converting rotary motion into reciprocating motion. The cam is formed with a flange or spline, disposed spirally on the curved face of the wheel. The spline engages a notch in a rod and gives the latter a reciprocating movement when the cam is rotated.

163. Elliptical Crank.—Two cranks are connected with a single pitman, the outer one, through a connecting link. The circular movement of the inner crank causes the outer end of the pitman to move in an elliptical orbit, thereby increasing its leverage at certain points.

164. A device for gripping a bar or cable. The bar travels between a fixed guide and the cam-shaped head of a lever. When the lever is thrown up, friction of the bar on the cam tends to rotate the latter until it becomes wedged between the cam and the fixed guide

165. Lever Toggle-joint.—A device commonly used on letter-presses. One of the two connected arms is pivoted to the platen of the press and the other is hinged to a fixed standard. By lifting the lever on one of the toggle arms the arms will be brought into vertical alignment with each other, producing a powerful pressure on the platen.

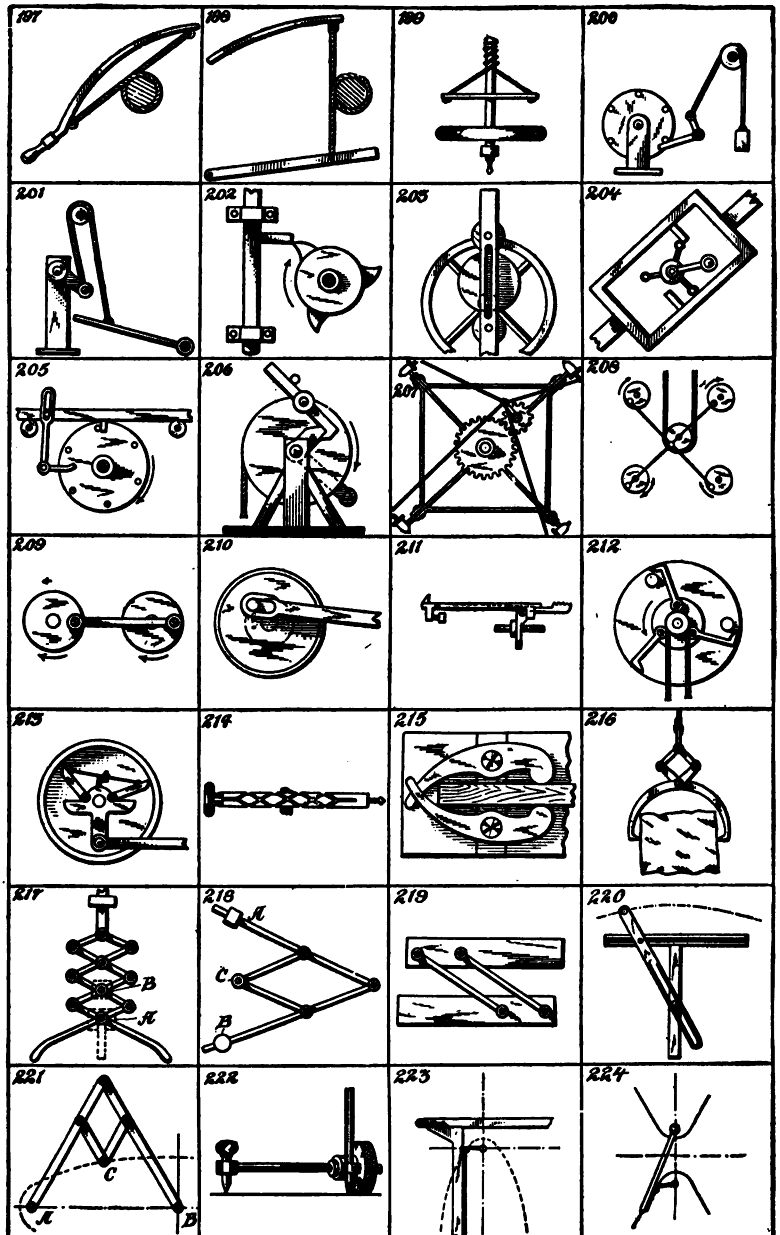
166. Screw Toggle Press.—Two toggle arms are hinged to the letter-press and at their outer ends are hinged to nuts on the feed screw. The screw is cut with right- and left-hand threads. so that when turned in operative direction it will draw the arms toward each other and press the platen downward.

167. Bell Crank Toe Levers.—Two bell crank levers are provided with projecting toes which bear against each other When one of these levers is swung on a center it causes the other to swing also, but at a variable speed, due to the varying leverage. This mechanism is used for a type of valve gear.

168. Wiper Cam.—A type of cam used on certain stamp mills to lift the hammer. The cam bears against a flanged collar on the hammer spindle, which permits the latter to rotate.

MISCELLANEOUS MOVEMENTS.

169. Device for transmitting reciprocating motion from one pair of rods to another pair lying at right angles thereto. The rods are all connected by links so that when two opposed rods are moved inward or toward each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other, the other two rods will be moved outward, and *vice versa*. Also if two adjacent rods be moved the one outward, and the other inward, the opposite rods will be moved one outward and the other inward respectively.

170. Means for converting rotary into reciprocating motion. A bent shaft carries at its outer end an arm which is loosely mounted thereon. The lower end of this arm engages a slot in a bar which is mounted to slide in suitable guides. As the bent shaft rotates, the arm which is prevented from rotating with the shaft is given a rocking movement in the direction of its axis, and thus imparts a reciprocating movement to the bar.

171. Movement used on hand stamps. The plate which carries the type normally lies face upward against an ink pad, and is formed with a flange at each end in which cam slots are cut. The type plate is pivoted in a yoke piece to which the handle is secured, the pivot pins passing through slots in the uprights of the frame. When the handle is depressed, the type plate is carried downward and at the same time rotated by engagement with two pins which operate in the cam slots so that the type will face downward when brought into contact with the paper. The parts are returned to normal position by a spring on release of the handle.

172. A peculiar device for alternately rocking a pair of levers by means of a reciprocating rod. The rod carries a bell crank lever, *A*. This lever is normally held in the position illustrated by two pins against which it is pressed by the spring-pressed rod. Two bell crank levers, *B* and *C*, connected by a bar, are hinged adjacent to the rod. With the parts in the position illustrated, when the rod is drawn forward, one arm of the bell crank, *A*, will engage a pin at the end of lever, *B*, and will be thereby turned until it engages a stop piece, *D*, on the rod, after which it will operate to swing bell crank, *B*, on its axis. Owing to the connection between the levers *B* and *C*, the latter will also be swung but in the opposite direction. On return of the rod the bell crank lever, *A*, is brought to normal position by the two position pins, and when next the rod is drawn forward, the other arm of lever *A* will engage a pin on lever *C*, returning both levers *B* and *C* to their original positions.

173. Mechanism for transmitting rotary motion at increased speed from one shaft to another in alignment therewith. The lower or driving shaft carries a crown wheel at its upper end which is engaged by a second crown wheel having universal joint connection with a stationary central post. The latter is supported from the frame by cross arms, which are adapted to engage slots cut in the second crown wheel, and thus prevent the wheel from rotating. The upwardly projecting frame of the second crown wheel is connected to a wheel on the upper shaft, but eccentric thereto, by means of a ball-and-socket joint. The driven crown wheel is thus tilted so as to engage the teeth of the driving wheel. As the latter rotates the driven wheel is given a rocking or wobbling movement, which rotates the upper shaft. A slight movement of the lower shaft thus produces a complete rotation of the upper shaft.

174. A device for converting reciprocating into rotary motion and *vice versa*. Two intermeshing gear wheels are provided with spring pawls oppositely disposed on the gears, and adapted alternately to snap into engagement with a lug on a reciprocating rod and thereby impart rotary motion to the gears.

175. A device for spacing apart a number of bars. The bars are arranged to slide with a certain amount of friction between guide pieces. Normally they are crowded together in a group by a pair of coil springs. A pair of rotating spur wheels whose teeth engage the pointed ends of the bars are mounted on either side to slide vertically in suitable guideways. The vertical movement of the gears carries the bars downward against the springs and the slow rotary movement of the gears successively releases the bars at regular intervals. The bars remain where released, being held by frictional engagement with the guide pieces.

176. An early form of flexible shaft coupling. One of the shafts is pointed and fits into a socket in the other shaft. Each shaft carries a collar and these are connected by a flat spiral spring.

177. Centrifugal hammer. Two hammers are hinged on a rapidly revolving disk. As the disk revolves, these hammers are alternately swung by the added force of gravity and of centrifugal action, on to the anvil. A very powerful stroke is thus given.

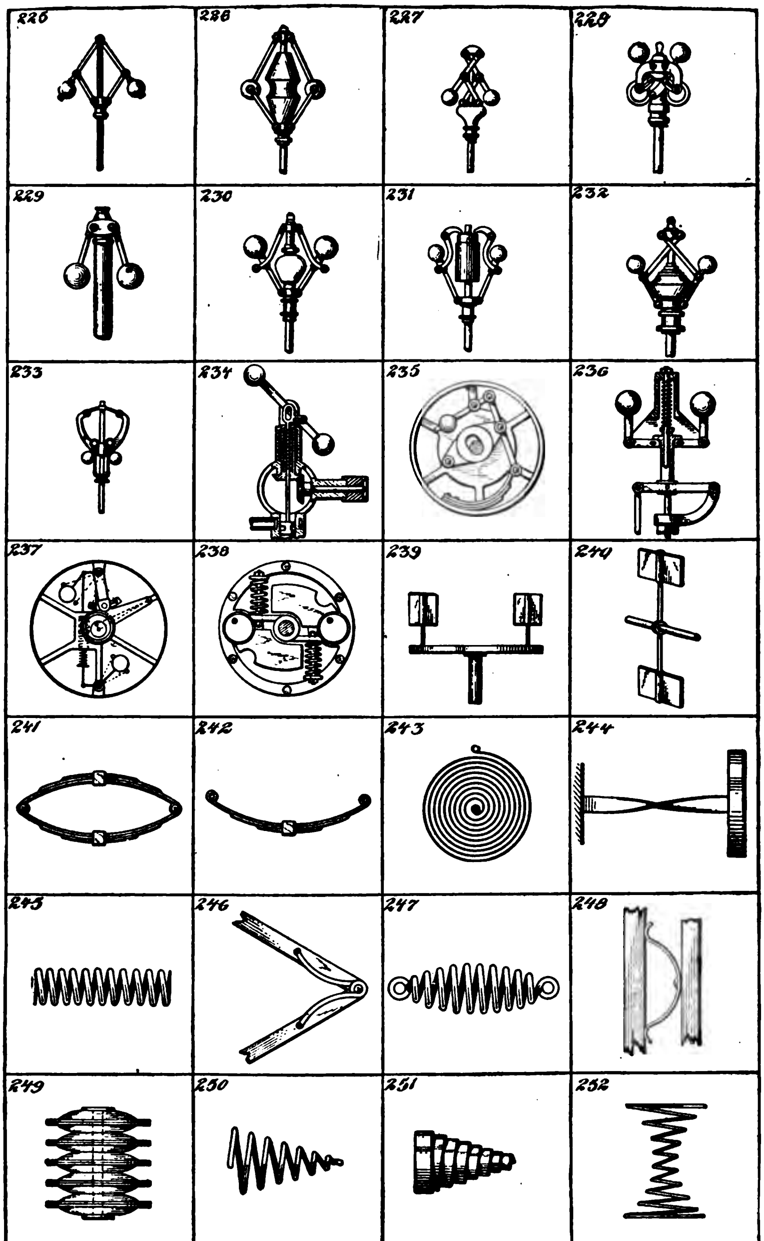
178. A device for communicating reciprocating motion of an engine to a rotating crank in such manner that the crank will have a greater throw than the stroke of the engine crosshead. The connecting rod acts on the crank shaft through a "lazy tongs" which multiplies the stroke and affords a better leverage upon the same.

179. A device for producing two rotations of the crank shaft of an engine at each complete (forward and return) stroke of the crosshead. The crosshead of the engine is connected by a rod to a pair of connected levers, one of which is pivoted on a fixed pin and the other to the working beam. Owing to the toggle action of the levers the working beam will rise and fall twice while the crosshead moves to its outer position and returns.

180. A device for converting rocking movement into rectilinear reciprocating movement, usually called "parallel" motion. Two links pivoted on the fixed pin *A* connect at their outer ends with two links pivoted on a rod at *D*. The latter links are also connected to a pair of links pivoted to a rock arm *C*. The distance between *A* and *B*, the fixed pivot of the rock arm, is equal to the distance between *B* and *C*. Owing to the fact that the double link-quadrangle swings on two pivots, it will be lengthened when swung out of the vertical position, thus giving a rectilinear motion to the rod *D*. This movement is called "Peaucellier's" parallel motion. It is used to give rectilinear movement to a pump rod or to the piston rod of an engine.

181. Another device for producing rectilinear movement of a pump rod. The rod, instead of being directly connected to the working beam of an engine, is connected thereto by cross links. This motion, however, is not a true "parallel motion," but the rod is strained by cross connection.

182 to 184. Devices for overcoming "dead" centers of cranks. In Figure 182 the pitman is connected to one end of a leaf spring, whose other end is connected to the crank disk. The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pitman is thus permitted to play between two socket lugs projecting from the face of the disk. Just before the back center is reached, the pitman slips out of engagement with the lower socket, by reason of the tensile strain on the spring, then on the return stroke, the connection of the spring being above the line of centers, the spring yields and throws the pitman back into the lower socket, and acts upon it to rotate the disk, until the forward center is reached, when the action will be the reverse of that just described. In 183 the pitman is attached to a plate secured to the flywheel at two points by screws passing through slots cut diagonally in the plate. In starting the wheel from either of its dead centers, the pitman will cause the plate to slide on its diagonal slots and the pitman will thus carry itself out of the dead center. The plate will then be returned to normal position by a spring. The device shown in 184 is specially applicable to machines operated by treadles. Attached to the pitman is a piston acting in a cylinder pivoted to the rod on which the treadle is hinged. Within the cylinder are two coil springs which alternately act on the piston to carry the crank over the two dead centers.

185. A device for transmitting motion from one shaft to another lying at right angles thereto. The driving shaft is formed with a spiral ribbon which acts between rollers radially mounted on a wheel, carried by the driven shaft. The wheel is formed with a double series of rollers, one on each side of the spiral shaft, but the forward series has been cut away in the illustration to show detail. The action is similar to that of a worm and worm wheel, but friction is reduced by the use of the rollers.

186. An internal worm gear is here shown which offers the same advantages as the internal spur gear, namely, that of greater strength due to the fact that the area of contact between the worm and the worm wheel is increased. The worm wheel is made up of two hollow sections, clamped together, but so spaced as to form a slot in the rim through which the worm shaft passes.

187. Means for converting rotary motion into rocking motion. The power shaft carries two cams formed with corrugated peripheries. On opposite sides of the rock shaft are two rollers, one for each cam. The cams are so spaced that when one roller is being lifted, the other will fall. Thus, a rocking motion is imparted to the rock shaft. The same effect may be produced by using a single broad cam for the two rollers, but spacing one roller a little in advance of the other on the rock shaft.

188. Another form of internal worm gear. A worm wheel is mounted on a stationary bracket and engages the spiral thread formed in a ring. As the ring revolves about the gear, the latter is caused to slowly rotate. As in Figure 186, a very strong construction and powerful transmission is afforded by this arrangement

189. A sliding toggle movement is here shown for producing great pressure in a direction at right angles to that of the impelling force. The toggle members are so mounted and are of such shape that they combine the action of the inclined plane with the ordinary toggle action.

190. Means for giving parallel movement to the paddles of steamboats, etc. The power shaft carries a disk which is connected by a series of hinged links with a ring held eccentrically to the shaft, between pairs of rollers. The paddles are attached to the links and are thereby kept parallel, while the disk and ring rotate. This same arrangement can be used to communicate motion to shafts lying out of alignment with each other, one of the shafts being attached to the ring.

191. Device for transmitting motion from one shaft to another at decreased velocity. The device is here shown diagrammatically. The driving shaft carries an eccentric *A*, upon which spur gears *B* and *C* are fitted to turn freely. The latter are permanently secured together. Wheel *B* meshes with internal gear *D*, on the driven shaft, and wheel *C* meshes with the stationary internal gear *E*. In operation the eccentric carries gear *C* about gear *E*, thereby causing it to rotate on its own center. The gear *B* will be revolved by the eccentric in one direction and be rotated in the opposite direction by the gear *C* to which it is attached, thus causing the gear *D* to move at a reduced speed,

192 to 196. Ball-bearing Devices.—In 192 is shown a ball-bearing knuckle joint consisting of a flanged socket member having sockets for the reception of steel friction balls, and a second member formed with flanges which bear against the friction balls. When the device is in operation, the balls will roll back and forth in their sockets at each rotation of the knuckle joint. In 193 a common form of ball-bearing is shown. The balls are held in stationary cups and bear against cones on the rotating shaft. 194 shows an end-thrust ball bearing of common form. 195 shows a ball-bearing wheel or caster. The balls are arranged to travel over an endless path, being guided from the forward end of the wheel bearing, through a passageway in the body of the caster, to the rear of the wheel bearing surface. 196 shows the same principle applied to a worm and worm wheel. The thread of the worm does not engage the teeth of the worm wheel, but communicates motion thereto through a series of balls. The latter, when they reach the end of the worm thread, are guided back through a passageway in the worm body to the beginning of the thread.

197. Means for converting reciprocating rectilinear movement into reciprocating rotary movement. A primitive form of turning lathe. The wooden shaft or other object to be turned, is mounted to rotate freely between pivot pins. A rope coiled about the shaft has its free ends secured to a spring bow. In operation, the handle of the bow is seized in one hand, and the other hand holds the tool against the work, which is rotated first in one direction, and then in the other, by moving the bow back and forth.

198. This is another form of primitive lathe which, however, is adapted to be driven by foot power. The rope, which is wound around the shaft is secured at its upper end to a spring, usually the end of a thin board, and at its lower end to a pedal. When the latter is depressed, the shaft will rotate toward the cutting tool and on its release the spring will cause it to rotate back, ready for the next downward stroke of the pedal. This type of

lathe is still commonly used in some Eastern countries.

199. An ancient form of drill, but one which is still used by jewelers. Coiled about the spindle of the drill are two cords whose lower ends are secured to a cross piece mounted to slide up and down on the spindle. When the cross piece is pressed downward, it causes the cords to uncoil, rotating the spindle. When the cross piece reaches the bottom of its stroke the pressure on it is relieved, and due to the momentum of a heavy flywheel on the spindle, the latter continues to rotate, recoiling the cords and lifting up the cross piece. On the next downward stroke of the cross piece, the spindle will rotate in the opposite direction.

200. Trip hammer. A rotating disk is formed with a series of pins adapted consecutively to depress one arm of a bell crank to the opposite arm of which a hammer weight is connected by a cord. When the bell crank clears a pin on the disk, the weight drops, delivering the blow, and is then lifted again by the next pin acting on the bell crank.

201. Means for converting reciprocating motion into rotary motion. A rope attached at one end to a foot pedal passes over an intermediate pulley, and is attached at the other end to the weighted crank arm of a shaft. The arrangement is such that on the downward or power stroke of the pedal, the weighted arm will be lifted to the vertical position, when it will be assisted by gravity and its own momentum to continue its rotation and lift the pedal for the next downward stroke.

202 to 205. Means for converting rotary motion into rectilinear motion. In 202, secured to a rotating shaft is a cam formed with projecting horns, which are adapted to successively engage a lug on a sliding rod. The rod is thereby given a trip-hammer movement, dropping by gravity as the lug clears the horns. In 203, a disk mounted eccentrically on a rotating shaft is engaged on opposite sides by a pair of rollers, pivoted to a rod. As the shaft rotates, the rod will be moved up and down, following the eccentric movement of the disk. This movement is used on windmills to transmit motion from the rotating windmill shaft to the pump rod. In 204 a shaft is provided with radial arms bearing rollers at their outer ends. These are adapted to operate within a frame mounted to slide, and formed with two lugs diagonally disposed on opposite sides of the frame. When the shaft is rotated, by means of the crank arm shown, the frame will be moved first to one side by one of the rollers engaging one of the lugs, and then in the opposite direction by another of the rollers moving into engagement with the other lug. In 205, a sliding carriage is formed with a lug adapted to be engaged successively by a series of pins on a revolving disk. The carriage will be moved forward by one of the pins until the latter clears the lug, when the carriage will be moved back again by another pin engaging an arm of a bell crank whose other arm engages the carriage.

206. Automatic release for a winding drum. A winding drum is mounted to turn freely on a shaft. A hook is pivoted on the face of the drum, and when it is desired to rotate the drum the hook is brought into engagement with a tappet on the shaft. When, however, the weight has been raised to a predetermined position by the winding drum, a pin strikes the hook, releasing it from engagement with the tappet and permitting the weight to drop.

207. An amusement device called the "Flying Horse" used in parks and fairs. A frame mounted to rotate on a vertical spindle, is provided with a simple gear wheel, which meshes with a driving pinion. By alternately pulling the cords, radiating from a crank on the shaft which carries the pinion, the persons occupying the seats or horses at the corners of the frame, are enabled to keep the apparatus in motion.

208. This figure shows a single pulley driving four other pulleys by means of a cross-shaped connecting rod. This form of drive is occasionally used for rotating wheels or cylinders which lie so close to each other that no gearing or other mechanism for transmitting motion can be used.

209. This figure illustrates the rather curious fact that if two wheels are coupled together by a connecting rod, whose crank pins are respectively equally distant from the centers of the wheels, then while one wheel is constantly rotated in one direction the other may be rotated in the same direction, or in the opposite direction, as desired.

210. A stop motion used in brick machines for drawing the mold back and forth, and bringing it to rest at each stroke to permit of depositing the clay and removing the brick. A rotating wheel carries a crank pin which engages a slot in a connecting rod. At the end of its forward stroke, and at the end of its return stroke the connecting rod will remain stationary, while the crank pin moves from one end of the slot to the other.

211. A device used in sewing machines for feeding the goods under the needle. The feed bar is formed with teeth at one end and the opposite end is pivoted between the arms of a forked lever. The feed bar is lifted by a peripheral projection on a cam, and at the same time the forked lever is moved forward by a projection on the side face of the cam, which bears against a lug carried on the lever. A spring at the opposite end of the lever normally holds the lug in contact with the face of the cam.

212. Elevator safety device. Secured to the side of the elevator shaft is a plate formed with one or more studs. To the winding drum of the elevator a number of hooks are pivoted. When the drum rotates the hooks are thrown out by centrifugal action, and if dangerous speed is acquired, they swing out far enough to catch hold of one or more of the studs, bringing the drum to a stop. The shock of the sudden stoppage is usually taken up by a coil spring on the drum.

213. A device for converting oscillating motion of a lever into intermittent rotary motion. A crank arm which is provided with two pawls hinged to its upper end, is oscillated within the rim of a wheel. The pawls are connected by a cord to a small crank, which may be turned so as to bring one pawl into frictional engagement with the rim of the wheel, and thereby cause the wheel to rotate intermittently. When it is desired to reverse the direction of rotation, the crank is turned, raising the first pawl and bringing the other one into engagement with the wheel.

214. Means for converting rectilinear motion into rotary motion. This is used on certain forms of drill stocks. The drill stock is cut with two spiral grooves, one of which

is left-handed and the other right-handed. A ring on the drill stock is provided with a follower which follows one of the grooves on the forward stroke, and the other groove on the return stroke, thus causing the drill to turn always in the same direction.

215. An automatic bench clamp, used by carpenters for holding the work while planing, etc. Pivoted to the work bench are two cam levers, formed with curved ends, which are moved apart by the work as it is pressed in between them, thus causing the clamping ends of the levers to tightly grip the work.

216. Gripping tongs for lifting stones and the like. The upper arms are connected to a shackle by a pair of links so that when a pull is exerted on the shackle, the arms are drawn together, pressing the points into the stone; the heavier the stone lifted the more tightly will the arms be drawn together, thus increasing the grip on the stone.

217. A series of cross connected levers used for multiplying or reducing motion. In the illustration, the lowest pair of levers is pivoted to a fixed pin *A*, and the arrangement is such that if one pair of the crossed levers be folded together, the entire series will fold, giving the rod attached to the upper pair of levers a greatly multiplied longitudinal movement, and conversely if the rod be moved, a greatly reduced motion will be given to the lower pair of links. The extent to which the motion is multiplied or reduced is directly proportional to the number of pairs of levers in the series. This device is called a "lazy tongs." The figure also shows a means for multiplying motion imparted from one rectilinear reciprocating rod to another. If the fixed pivot of the lazy tongs be at *B*, on giving reciprocating motion to the lower rod, the reciprocating motion will be imparted to the upper rod, but the travel of the upper rod will be twice that of the lower rod.

DRAFTING DEVICES.

218. A pantograph, or an instrument for reproducing a drawing on a larger or smaller scale. It comprises two levers hinged together and connected by a pair of hinged links. One of the levers carries a slide, *A*, in which a pencil is secured. The other lever carries a pivot pin, and the tracing point is located at *C*. In use the device is made to turn on the fixed point at *B*, then on moving the tracing point *C* over a drawing, the same will be reproduced by the pencil at *A*. By varying the positions of the pencil and the pivot pin on their respective levers, the reproduction may be made larger or smaller than the original as desired.

219. This figure shows the "parallel ruler," a device used for drawing parallel lines. Two parallel rulers are connected by a pair of parallel links of equal length. The rulers will then always lie parallel to each other, whether swung apart or moved together.

220. A device for drawing a conchoid curve. A conchoid curve may be described as a curve of such form that when measured along lines drawn from a fixed point called the pole, it will, at all points, be equidistant from a straight line, called the asymptote. The device shown comprises a T-square with grooved head-piece adapted to receive a slide pivoted to a bar. A slot in the lower end of this bar engages a pin on the blade of the T-square and the opposite end of the bar carries the scribing pencil. The pin represents the pole and the grooved head of the T-square represents the asymptote. The curve traced by the pencil when measured along the bar lies everywhere equidistant from the asymptote.

221. An ellipsograph or a device for drawing ellipses. This is similar to the pantograph shown in Figure 218. The fixed pivot, however, is at *B*, the tracing point at *A*, and the pencil at *C*. When *A* is moved in a straight line toward or away from *B*, the pencil *C* will trace an elliptical curve.

222. A device for drawing a helical curve. A rod provided with a pivot point is threaded to receive a nut with a milled flange. As the rod is moved about its center, the nut is rotated by a frictional contact of the flange with the drawing paper, and is thus slowly fed toward or away from the center. A pencil carried by a sleeve on this nut will then trace a helical curve.

223. A device for describing parabolas. A pin is placed at the focus of the desired parabola and a straight-edge is placed on the line of the directrix. A slack cord is secured at one end to the pin, and at the other to the blade of a square whose stock bears against the straight edge. The slack of the cord is taken up by the pencil, which bears against the blade of the square. Sufficient slack is provided to make the distance of the pencil from the focus equal to its distance from the straight-edge or directrix. The curve then described by the pencil while keeping the cord taut against the square, as the square is moved along the straight-edge, will be a parabola.

224. A device for describing hyperbolas. The two pins shown represent the foci of two opposite hyperbolas. A ruler turns on one of these pins as a center, and its opposite end is connected with the other pin by a slack cord. The slack of the cord is taken up by the pencil which bears against the ruler. The curve described will then fulfil the conditions of a hyperbolic curve, which requires that the distance from any point in the curve to its focus, minus the distance from that point to any other fixed point or focus, should always be a constant quantity.

GOVERNORS.

A governor of a steam engine is a device for automatically operating the throttle, or for shortening the stroke of the slide valve when the engine attains a dangerous speed.

225. Watt's Governor.—When a dangerous speed is acquired, the centrifugal force acting upon a pair of balls tends to lift a sleeve which, through a bell crank, operates the throttle.

226. Porter's Governor.—The operation is very similar to that of Watt, but the balls are required to lift a weight which may be adjusted as desired.

227. Kley's Cross Arm Governor.—The degree of sensitiveness is governed by the length of the cross arms, and also by an adjustable weight, which is lifted by the balls.

228. Buss' Governor.—Two pairs of balls are used, one pair acting to counterbalance the other.

229. Tangye's Governor.—The balls when thrown out by centrifugal action depress a rod in the hollow central shaft and this rod acts directly on the block in the link thus shortening the stroke of the slide valve.

230 and 231. PROELL'S GOVERNOR.—In 230 the balls, aside from lifting a weight, act to compress a spiral spring. In 231 the outward movement of the balls is controlled by an air dashpot.

232. COSINE GOVERNOR.—A cross arm governor which acts to raise a weight.

233. PARABOLIC GOVERNOR.—The balls move on parabolic guide arms, which modify the effect of the centrifugal force, and produce equal valve movement, which is exactly proportional to the speed of the engine.

234. OSCILLATING LEVER GOVERNOR.—The balls are secured to the ends of a lever, which assumes a more horizontal position as the speed of the engine increases. A spring normally holds the arm in the tilted position illustrated.

235. SWEET'S FLYWHEEL GOVERNOR.—The centrifugal action of the ball moves the eccentric toward the center, thus reducing the stroke of the slide valve. A leaf spring resists the centrifugal action of the ball.

236. HARTNELL'S EXPANSION GOVERNOR.—The balls are thrown out by centrifugal force against the action of a spring raising the block in the link and thus varying the stroke of the valve.

237. HARTNELL'S CRANK SHAFT GOVERNOR.—The weights operate against the spring to move a toothed sector, which moves the eccentric toward the center of the crank shaft, thus varying the stroke of the slide valve.

238. TURNER'S CRANK SHAFT GOVERNOR.—The weights have bearings in the side plates of the governor. They also carry pins by which they are connected to the eccentric. When the weights are thrown out by centrifugal action, they move the eccentric toward the center of the crank shaft.

239 and 240. VANE GOVERNORS.—The shaft is prevented from rotating too rapidly by the atmospheric resistance acting on a pair of vanes. This resistance may be varied by adjusting the vanes to different angles. In some types of vane governors the inclined vanes serve to lift a sleeve, cutting off the supply of power.

SPRINGS.

241 and 242. LAMINATED or CARRIAGE SPRINGS, used on carriages to take up the jolts of the wheels in passing over uneven roads. 241 shows the elliptical form, and 242 the semi-elliptical form. They are built up of flat spring metal strips.

243. WATCH or CLOCK SPRING, used to drive a watch or clock train. The spring is formed of a flat spring metal strip, wound into a flat coil.

244. RIBBON SPRING.—A strip of flat spring metal mounted to exert a torsional pressure.

245. SPIRAL SPRING.—A length of round spring wire wound into spiral form. This spring could be used either as a tension or as a compression spring, though usually it has the form shown in Figure 247 when used as a tension spring. A spiral spring should never be extended or compressed more than one-third of its length.

246. SEAR SPRING.—This spring gets its name from its use in gun locks for causing the sear to catch in the notch of the tumbler. However, the spring is here shown as holding apart the arms of a compass.

247. TENSION SPIRAL SPRING.—A spiral spring which tapers toward the ends so that the pull will come centrally on the spring, thus giving an even tension and avoiding side strains.

248. FLAT or LEAF SPRING.—A strip of flat spring metal used chiefly as a compression spring. A spring of this type is apt to lose its resiliency after continued use.

249. DISK SPRING.—A compression spring made up of a series of dished disks or plates.

250. HELICAL SPRING.—This spring differs from the spiral spring, Figure 245, in that it is formed by being wrapped around a cone, whereas a spiral spring is formed by being wrapped around a cylinder. The helical spring may safely be compressed until it lies flat like a clock spring.

251. VOLUTE SPRING.—A compression spring formed by coiling a flat spring ribbon into a helix.

252. FURNITURE SPRING.—A compression spring comprising a double helical spring used in furniture to support the cushioned backs or seats of chairs. This spring is also used in bed springs.

TRANSMISSION OF POWER BY BELTING.

THE TENACITY OF GOOD NEW BELT LEATHER varies from 3,000 lb. to 5,000 lb. per square inch of sectional area.

THE COEFFICIENT OF FRICTION between ordinary belting and cast-iron pulleys is about .423.

THE THICKNESS OF BELTS varies from three-sixteenths to five-sixteenths of an inch, or an average of one-fourth of an inch.

TENACITY OF RIVETING AND LACING.—The ultimate tenacity of good single leather belting may be taken at about 1,000 lb. per inch in width; the corresponding strength of a riveted joint being about 400 lb., a butt laced joint about 250 lb., and an ordinary overlap laced joint 470 lb. It is not customary, however, to allow an effective strain of more than one-fourth these amounts.

WORKING STRESS OF BELTS.—The following are the effective working stresses allowed for the different kinds and thicknesses of belts referred to in the table of powers.

Ordinary single belts,		50 lb.
Light double belts,		70 lb.
Heavy double belts,		90 lb.
Link belts,	[illegible] in. thick,	42 lb.
" "	[illegible] in. "	48 lb.
" "	[illegible] in. "	57 lb.
" "	[illegible] in. "	66 lb.
" "	[illegible] in. "	78 lb.
" "	1 in. "	90 lb.

SPEED OF BELTING.—On ordinary shop line shafts the velocity of the belts varies from 1,000 ft. to 1,500 ft. per minute. Lathe belts vary from 1,500 ft. to 3,000 ft. per minute.

STRESS ON SHAFTING.—The cross stress on shafting arising from the sum of the tension on the two sides of the belt may be taken at 90 lb. per inch in width.—Practical Electrical Engineers' Pocket Book and Diary.

HEIGHT OF COLUMNS, SPIRES AND TOWERS

Name	Location	Feet
Eiffel Tower	Paris, France,	984
Washington Monument	Washington, D. C.,	555
Cathedral	Ulm, Germany,	529
Cologne Cathedral	Cologne, Germany,	512
Pyramid of Cheops	Egypt,	482
St. Stephen's Cathedral	Vienna, Austria,	470
Strassburg Cathedral	Strassburg, Germany,	468
St. Peter's	Rome, Italy,	448
Cathedral	Salisbury, England,	4[illegible]6
Cathedral	Antwerp, Belgium,	4[illegible]2
Torrazzo Tower	Cremona, Italy,	396
Cathedral	Florence, Italy,	387
St. Paul's Cathedral	London, England,	364
Cathedral	Milan, Italy,	355
Hotel des Invalides	Paris, France,	344
St. Patrick's Cathedral	New York, U. S. A.,	332
St. Mark's (Campanile)	Venice, Italy,	323
Trinity Church	New York, U. S. A.,	284
Westminster Abbey	London, England,	283
Notre Dame	Paris, France,	223
Bunker Hill Monument	Boston, Mass,	221
Leaning Tower of Pisa	Pisa, Italy,	179

TABLE OF HIGH BUILDINGS WHICH EXCEED 300′ ABOVE SIDEWALK LEVEL.

Building.	Height In Feet
Woolworth Building	750
Metropolitan Tower	700
Singer Tower	612
Municipal Building	560
Bankers' Trust Building	539
Whitehall Building	446
Heidelberg Building	410
Liberty Tower	385
Park Row Building	382
Broadway-Cortlandt Building	360
Manhattan Life Building	348
Wall Street Exchange Building	345
221 West 41st St. & 218-26 W. 42d St.*	341
Walker-Lispenard Building*	338
110-112 West 40th Street*	335
Times Building	331
43-49 Exchange Place	327
37 Wall Street	318
80 Maiden Lane*	315
World Building	309
St. Paul Building	308
Rector St., Trinity Pl. & Greenwich St.	308
Hotel McAlpin*	307
West St., Cedar to Albany Sts.	306
60 Broadway	306
43rd-44th Sts., Madison & Vanderbilt Aves.*	306

* Buildings are in course of construction.

Revised by Bureau of Buildings, Borough of Manhattan, N. Y. C.

NAMES OF THE MONTHS IN FIVE LANGUAGES.

English.	Spanish.	Portuguese.	French.	German.
January.	enero.	janeiro.	janvier.	Januar.
February.	febrero.	fevereiro.	février.	Februar.
March.	marzo.	março.	mars.	März.
April.	abril.	abril.	avril.	April.
May.	mayo.	maio.	mai.	Mai.
June.	junio.	junho.	juin.	Juni.
July.	julio.	julho.	juillet.	Juli.
August.	agosto.	agosto.	août.	August.
September.	septiembre.	setembro.	septembre.	September.
October.	octubre.	outubro.	octobre.	Oktober.
November.	noviembre.	novembro.	novembre.	November.
December.	diciembre.	dezembro.	décembre.	Dezember.

NUMBER OF WORDS IN A LINE AND PAGE AND THE NUMBER OF EMS IN A PAGE

Sizes of type and measures.	Number of words in a line.	Number of words in a page.		Number of lines in a page.		Number of ems in a page.
		Solid.	Leaded.	Solid.	Leaded.	
10-point:						
General order	10	386	294	38	32	1,050
Document	12	693	528	54	45	1,856
Quarto	16	1,113	848	63	53	2,992
Census	18	1,386	1,056	68	57	3,621
8-point:						
General order	12	588	423	48	38	1,643
Document	15	1,056	759	67	54	2,920
Quarto	20	1,696	1,219	79	64	4,675
Census	25	2,112	1,518	84	68	5,696
6-point:						
General order	13	864	625	63	48	2,911
Document	17	1,551	1,122	90	67	5,141
Quarto	24	2,491	1,802	106	80	8,249
Census	27	3,102	2,244	112	84	10,115
14-point:						
Bill	10	....	257	....	25	....

The above table is based on the Government "Printing Style Book."

CHAPTER V.

GEOMETRICAL CONSTRUCTIONS.

GEOMETRICAL FIGURES.

1. **Acute Angle.**—An acute angle is less than a right angle, or less than 90 degrees.

2. **Alternate Angles.**—The internal angles made by two lines with a third, on opposite sides of it. If the two lines are parallel, the alternate angles are equal. If the parallels *AB*, *CD*, be cut by the line *EF*, the angles *AGH*, *GHD*, as also the angles *BGH* and *GHC*, are called alternate angles.

3. **Arc.**—Any part of the circumference of a circle or other curve; a segment of a circle.

4, 5, 6, and 7. **Conic Sections.**—Formed by the intersections of cones and planes. The conic sections are the ellipse, parabola, and hyperbola. If the section be taken parallel to the base of the cone its outline will form a perfect circle. If the section be taken parallel to one side of the cone it will in outline have the form of a parabola (6). If the section be taken parallel to the axis of the cone its outline will have the form of a hyperbola (7). Any other section through the cone will in outline have the form of an ellipse (5).

8. **Chord.**—A right line marking the extremities of the arc of a circle.

9. **Circle.**—1. In geometry, a plane figure, comprehended by a single curve line, called its circumference, every part of which is equally distant from a point called the center. Of course all lines drawn from the center to the circumference, or periphery, are equal to each other. 2. In popular use, the line that comprehends the figure, the plane or surface comprehended, and the whole body or solid matter of a round substance, are denominated a circle; a ring; an orb; the earth.

10. **Curve.**—A curve line is one which may be cut by a right line in more points than one. A curve line is that which is neither a straight line nor composed of straight lines.

11. **Cube.**—A regular, solid body with six equal square sides.

12. **Cylinder.**—A solid body supposed to be generated by the rotation of a parallelogram round one of its sides; or a long, circular body, of uniform diameter, and its extremities forming equal parallel circles.

13. **Diagonal.**—The line extending from one angle to another of a quadrilateral or multilateral figure, and dividing it into two parts.

14. **Diagram.**—A figure, draught, or scheme delineated for the purpose of demonstrating the properties of any figure, as a square, triangle, circle, etc.

15. **Diameter.**—A right line passing through the center of a circle, or other curvilinear figure, terminated by the curve, and dividing the figure symmetrically into two equal parts.

16. **Ellipse.**—In conic sections, a figure formed by the intersection of a plane and cone when the plane passes obliquely through the opposite sides of the cone.

17. **Equilateral Triangle.**—A triangle having all three sides equal.

18. **Hexagon.**—A plane figure of six sides and six angles. If the sides and angles are equal, it is a regular hexagon. The cells of honey-comb are hexagons, and it is remarkable that bees instinctively form their cells of this figure, which fills any given space without any interstice or loss of room.

19. **Hypothenuse.**—The subtense or longest side of a right-angled triangle, or the line that subtends the right angle.

20. **Rectangular Triangle.**—If one of the angles of a triangle is a right angle, the triangle is rectangular.

21. **Right Angle.**—A right angle is one formed by a right line falling on another perpendicularly, or an angle of 90 degrees, making the quarter of a circle.

22. **Isosceles Triangle.**—If two of the sides only are equal in a triangle it is an isosceles or equicrural triangle.

23. **Oblique Line.**—An oblique line is one that, falling on another, makes oblique angles with it.

24. **Obtuse Angle.**—An angle greater than a right angle, or containing more than 90 degrees.

25. **Scalene Triangle.**—One in which all the three sides are unequal.

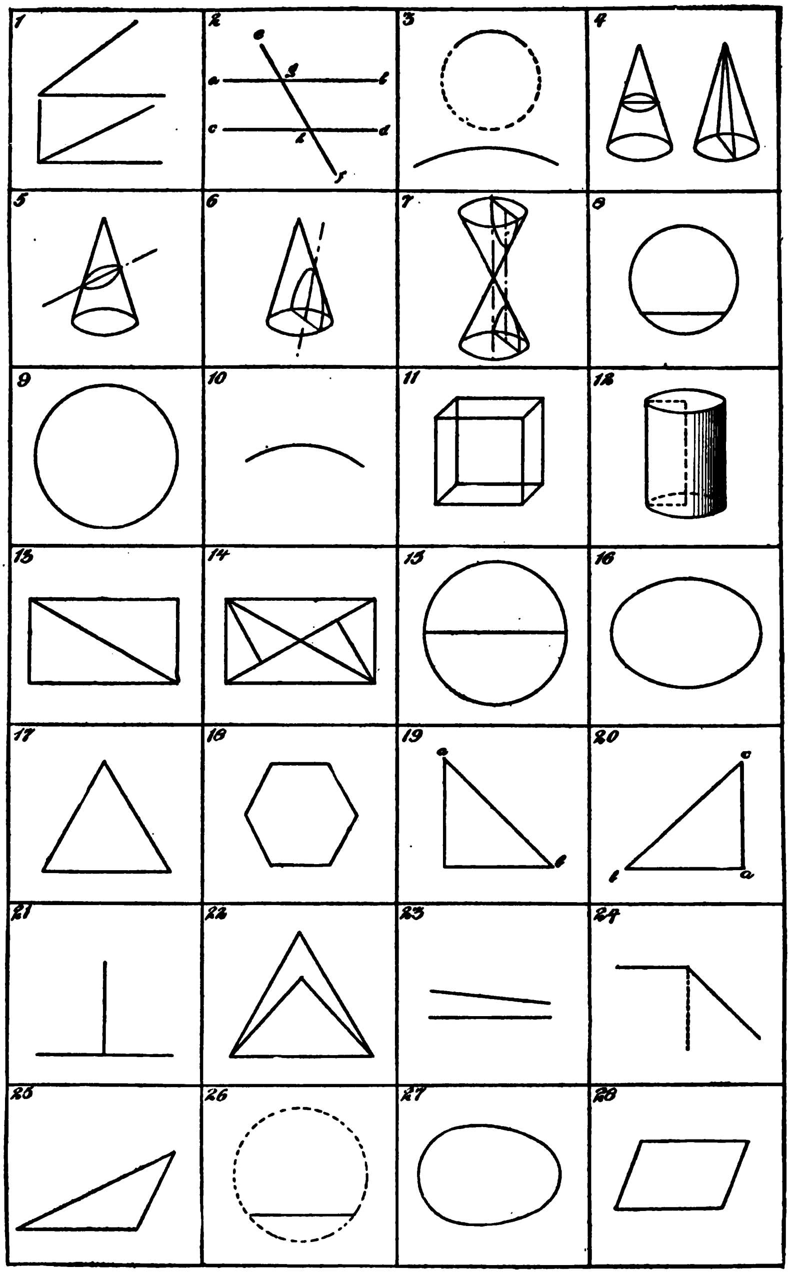
26. **Secant.**—The secant of a circle is a line drawn from the circumference on one side to a point without the circumference on the other.

27. **Oval.**—A body or figure in the shape of an egg, or of an ellipse.

28. **Parallelogram.**—1. In geometry, a right-lined quadrilateral figure, whose opposite sides are parallel, and consequently equal. 2. In common use, this word is applied to quadrilateral figures of more length than breadth.

29. **Sector.**—A part of a circle comprehended between two radii and the included arc; or a mixed triangle, formed by two radii and the arc of a circle.

30. **Parallelopiped.**—A regular solid comprehended under six parallelograms, the opposite ones of which are similar, parallel, and equal to each other; or it is a prism whose base is a parallelogram. It is always triple to a pyramid of the same base and height. Or a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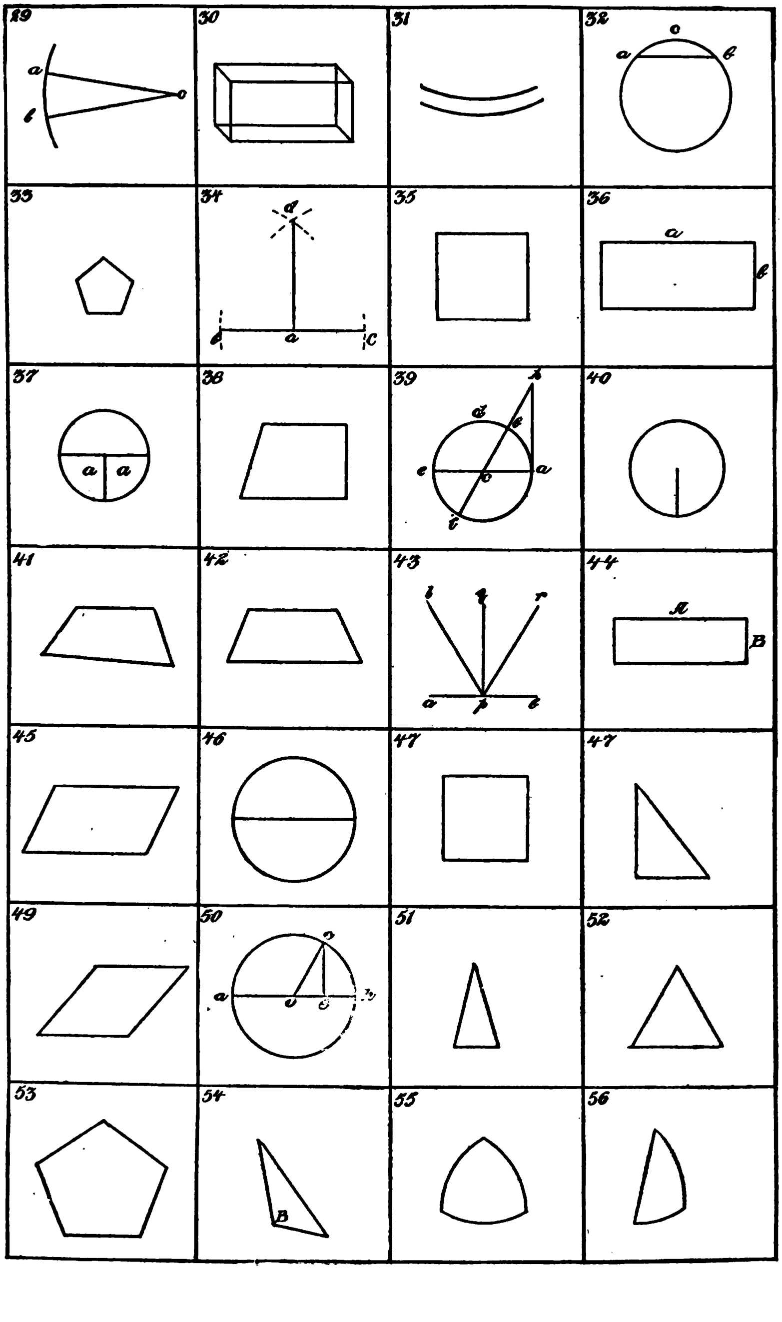
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parallelopiped is a solid figure bounded by six faces, parallel to each other, two and two.

31. PARALLEL LINES.—One line is parallel to another, when the lines are at an equal distance apart throughout the whole length.

32. SEGMENT OF A CIRCLE.—That part of the circle contained between a chord and an arc of that circle, or so much of the circle as is cut off by the chord. The segment of a sphere is a part cut off by a plane.

33. PENTAGON.—A plane figure having five angles, and consequently five sides.

34. PERPENDICULAR.—In geometry, a line falling at right angles on another line, or making equal angles with it on each side. Thus if the straight line *AD*, falling on the straight line *BC*, make the angles *BAD*, *DAC* equal to one another, *AD* is called a perpendicular to *BC*.

35. QUADRANGLE.—A plane figure having four angles, and consequently four sides.

36. RECTANGLE.—A four-sided figure having only right angles. A right-angled parallelogram.

37. QUADRANT.—The quarter of a circle or of the circumference of a circle.

38. QUADRILATERAL.—Having four sides, and consequently four angles.

39. TANGENT.—In the figure, let *AH* be a straight line drawn touching the circle *ADE* at *A*, one extremity of the arc *AB*, and meeting the diameter *IB* produced, which passes through the other extremity *B* to the point *H*; then *AH* is the tangent of the arc *AB*, or of the angle *ACB*, of which *AB* is the measure.

40. RADIUS.—A right line drawn or extending from the center of a circle to the periphery; the semidiameter of the circle. In trigonometry, the radius is equal to the sine of 90 degrees.

41. TRAPEZIUM.—A plane figure contained under four right lines, of which no two are parallel.

42. TRAPEZOID.—A plane, four-sided figure, having two of the opposite sides parallel to each other.

43. REFLECTION.—In the figure, let *AB* represent a smooth polished surface, or mirror, and suppose a ray of light proceeding in the direction *LP* to impinge on the surface at *P*, and to be reflected from it in the direction *PR*. From *P* draw *PQ* perpendicular to *AB*, then the angle *LPQ* is called the angle of incidence, and *QPR* the angle of reflection.

44. SUPERFICIES. A superficies consists of length and breadth; as, the superficies of a plate or of a sphere. Superficies is rectilinear, curvilinear, plane, convex, or concave.

45. RHOMBOID.—A figure having some resemblance to a rhomb; or a quadrilateral figure whose opposite sides and angles are equal, but which is neither equilateral nor equiangular.

46. SEMICIRCLE.—The half of a circle; the part of a circle comprehended between its diameter and half of its circumference.

47. SQUARE.—A rectilinear figure having four equal sides and four right angles.

48. RECTILINEAR TRIANGLE.—One in which the three lines or sides are all right lines, as distinguished from curvilinear triangle.

49. RHOMB. RHOMBUS.—An oblique-angled, equilateral parallelogram, or a quadrilateral figure whose sides are equal and the opposite sides parallel, but the angles unequal, two of the angles being obtuse and two acute.

50. SINE.—In the circle *ACH*, let *AOH* be a diameter, and let *CE* be perpendicular thereto; then shall *CE* be the sine of the arc *CH*, or of the angle *COH*, and of its supplement *COA*. The sine of a quadrant, or of a right angle, is equal to the radius. The sine of any arc is half the chord of twice that arc.

51. ACUTE-ANGLED TRIANGLE.—One having all three of its angles acute.

52. AN EQUILATERAL TRIANGLE.—One having all the three sides equal.

53. POLYGON.—A plane figure of many angles, and consequently of many sides; particularly, one whose perimeter consists of more than four sides.

54. OBTUSANGULAR TRIANGLE.—If one of the angles of a triangle is obtuse, the triangle is called obtusangular or amblygonous.

55. CURVILINEAR AND SPHERICAL TRIANGLES.—If the three sides of a triangle are all curves, the triangle is said to be curvilinear. If the sides are all arcs of great circles of the sphere, the triangle is said to be spherical.

56. MIXTILINEAR TRIANGLE.—If some of the sides of a triangle are right and others curve, the triangle is said to be mixtilinear.

GEOMETRICAL CONSTRUCTIONS.*

1.

To divide a given line *A B* into two equal parts; and to erect a perpendicular through the middle.

With the end *A* and *B* as centers, draw the dotted circle arcs with a radius greater than half the line. Through the crossings of the arcs draw the perpendicular *C D*, which divides the line into two equal parts.

2.

From a given point *C* on the line *A B*, erect a perpendicular *C D*.

With *C* as a center, draw the dotted circle arcs at *A* and *B* equal distances from *C*. With *A* and *B* as centers, draw the dotted circle arcs at *D*. From the crossing *D* draw the required perpendicular *D C*.

3.

From a given point *C* at a distance from the line *A B*, draw a perpendicular to the line.

With *C* as a center, draw the dotted circle arc so that it cuts the line at *A* and *B*. With *A* and *B* as centers, draw the dotted cross arcs at *D* with equal radii. Draw the required perpendicular through *C* and crossing *D*.

4.

At the end of *A* to a given line *A B*, erect a perpendicular *A C*.

With the point *D* as a center at a distance from the line, and with *A D* as radius, draw the dotted circle arc so that it cuts the line at *E* through *E* and *D*, draw the diameter *E C*; then join *C* and *A*, which will be the required perpendicular.

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5.
Through a given point *C* at a distance from the line *A B*, draw a line *C D* parallel to *A B*.
With *C* as a center, draw the dotted arc *E D*, with *E* as a center, draw through *C* the dotted arc F. C. With the radius *F C* and *E* as a center, draw the cross arc at *D*. Join *C* with the cross at *D*, which will be the required parallel line.

6.
On a given line *A B* and at the point *B*, construct an angle equal to the angle *C D E*.
With *D* as a center, draw the dotted arc *C E*; and with the same radius and *B* as a center, draw the arc *G F*; then make *G F* equal to *C E*; then join *B F*, which will form the required angle, $F\ B\ G = C\ D\ E$.

7.
Divide the angle *A C B* into two equal parts.
With *C* as a center, draw the dotted arc *D E*; with *D* and *E* as centers, draw the cross arcs at *F* with equal radii. Join *C F*, which divides the angle into the required parts.
Angles $A\ C\ F = F\ C\ B = \frac{1}{2}(A\ C\ B)$.

8.
Divide an angle into two equal parts, when the lines do not extend to a meeting point.
Draw the lines *C D* and *C E* parallel, and at equal distances from the lines *A B* and *F G*. With *C* as a center, draw the dotted arc *B G*; and with *B* and *G* as centers, draw the cross arcs *H*. Join *C H*, which divides the angle into the required equal parts.

9.
To construct a parallelogram, with the given sides *A* and *B* and angle *C*.
Draw the base line *D E*, and make the angle $F\ D\ E = C$; lines $D\ E = B$ and $D\ F = A$; complete the parallelogram by cross arcs at *G*, and the problem is thus solved.

10.
To divide the line *A B* in the same proportion of parts as *A C*.
Join *C* and *B*, and through the given divisions 1, 2, and 3 draw lines parallel with *C B*, which solves the problem.

11.
To find the center of a circle which will pass through three given points *A*, *B*, and *C*.
With *B* as a center, draw the arc *D E F G*; and with the same radius and *A* as a center, draw the cross arcs *D* and *F*; also with *C* as a center, draw the cross arcs *E* and *G*. Join *D* and *F*, and also *E* and *G*, and the crossing *o* is the required center of the circle.

12.
To construct a square upon a given line *A B*.
With *A B* as radius and *A* and *B* as centers, draw the circle arcs *A E D* and *B E C*. Divide the arc *B E* in two equal parts at *F*, and with *E F* as radius, and *E* as center, draw the circle *C F D*. Join *A* and *C B* and *D*, *C* and *D*, which completes the required square.

13.
Through a given point *A* in a circumference, draw a tangent to the circle.
Through a given point *A* and center *C*, draw the line *B C*. With *A* as a center, draw the circle arcs *B* and *C*; with *B* and *C* as centers, draw the cross arcs *D* and *E*; then join *D* and *E*, which is the required tangent.

14.
From a given point *A* outside of a circumference, draw a tangent to the circle.
Join *A* and *C*, and upon *A C* as a diameter draw the half circle *A B C*, which cuts the given circle at *B*. Join *A* and *B*, which is the required tangent.

15.
To draw a circle with a given radius *R*, that will tangent the circle *A B C* at *C*.
Through the given point *C*, draw the diameter *A C* extended beyond *D*; from *C* set off the given radius *R* to *D*; then *D* is the center of the required circle, which tangents the given circle at *C*.

16.
To draw a circle with a given radius *R*, that will tangent two given circles.
Join the centers *A* and *B* of the given circles. Add the given radius *R* to each of the radii of the given circle, and draw the cross arcs *C*, which is the center of the circle required to tangent the other two.

17.
To draw a tangent to two circles of different diameters.
Join the centers *C* and *c* of the given circles, and extend the line to *D*; draw the radii *A C* and *a c* parallel with one another. Join *A a*, and extend the line to *D*. On *C D* as a diameter, draw the half circle *C e D*; on *c D* as a diameter, draw the half circle *c f D*; then the crossings *e* and *f* are the tangenting points of the circles.

18.
To draw a tangent between two circles.
Join the centers *C* and *c* of the given circles; draw the dotted circle arcs, and join the crossing *m*, *n*, which line cuts the center line at *a*. With *a C* as a diameter, draw the half circle *a f C*; and with *a c* as a diameter, draw the half circle *c e a*; then the crossings *e* and *f* are the tangenting points of the circles.

19.
With a given radius *r*, draw a circle that will tangent the given line *A B* and the given circle *C D*.
Add the given radius *r* to the radius *R* of the circle, and draw the arc *c d*. Draw the line *c e* parallel with and at a distance *r* from the line *A B*. Then the crossing *c* is the center of the required circle that will tangent the given line and circle.

20.
To find the center and radius of a circle that will tangent the given circle *A B* at *C*, and the line *D E*.
Through the given point *C*, draw the tangent *G F*; bisect the angle *F G E*; then *o* is the center of the required circle that will tangent *A B* at *C*, and the line *D E*.

21.
To find the center and radius of a circle that

will tangent the given line A B at C, and the circle D E.

Through the point C, draw the line E F at right angles to A B; set off from C the radius r of the given circle. Join G and F. With G and F as centers draw the arc crosses m and n. Join m n, and where it crosses the line E F is the center for the required circles.

22.

To find the center and radius of a circle that will tangent the given line A B at C, and the circle D E.

From C, erect the perpendicular C G; set off the given radius r from C to H. With H as a center and r as radius, draw the cross arcs on the circle. Through the cross arcs draw the line I G; then G is the center of the circle arc F I C, which tangents the line at C and the circle at F.

23.

Between two given lines, draw two circles that will tangent themselves and the lines.

Draw the center line A B between the given lines; assume D to be the tangenting point of the circles; draw D C at right angles to A B. With C as center and C D as radius, draw the circle E D F. From E, draw E m at right angles to E F; and from F draw F m at right angles to F E; then m and n are the centers for the required circles.

24.

Draw a circle that will tangent two given lines A B and C D inclined to one another and the one tangenting point E being given.

Draw the center line G F. From E, draw E F at right angles to A B; then F is the center of the circle required.

25.

Draw a circle that will tangent two lines and go through a given point C on the line F C, which bisects the angle of the lines.

Through C draw A B at right angles to C F; bisect the angles D A B and E B A, and the crossing on C F is the center of the required circle.

26.

To draw a *cyma*, or two circle arcs that will tangent themselves, and two parallel lines at given points A and B.

Join A and B; divide A B into four equal parts and erect perpendiculars. Draw A m at right angles from A, and B n at right angles from B; then m and n are the centers of the circle arcs of the required *cyma*.

27.

To draw a *talon*, or two circle arcs, that will tangent themselves, and meet two parallel lines at right angles in the given points A and B.

Join A and B; divide A B into four equal parts and erect perpendiculars; then m and n are the centers of the circle arcs of the required *talon*.

28.

To plot out a circle arc without recourse to its center, but its chord A B and height h being given.

With the chord as radius, and A and B as centers, draw the dotted circle arcs A C and B D. Through the point O draw the lines A O o and B O o. Make the arcs C $o = A$ o and D $o = B$ o. Divide these arcs into any desired number of equal parts, and number them as shown on the illustration. Join A and B with the divisions, and the crossings of equal numbers are points in the circle arc.

29.

To find the center and radius of a circle that will tangent the three sides of a triangle.

Bisect two of the angles in the triangle, and the crossing C is the center of the required circle.

30.

To inscribe an equilateral triangle in a circle.

With the radius of the circle and center C draw the arc D F E; with the same radius, and D and E as centers, set off the points A and B. Join A and B, B and C, C and A, which will be the required triangle.

31.

To inscribe a square in a given circle.

Draw the diameter A B, and through the center erect the perpendicular C D, and complete the square as shown in the illustration.

32.

To describe a square about a given circle.

Draw the diameters A B and C D at right angles to one another; with the radius of the circle, and A, B, C, and D as centers, draw the four dotted half circles which cross one another in the corners of the square, and thus complete the problem.

33.

To inscribe a *pentagon* in a given circle.

Draw the diameter A B, and from the center C erect the perpendicular C D. Bisect the radius A C at E; with E as center, and D E as radius, draw the arc D E, and the straight line D F is the length of the side of the pentagon.

34.

To construct a *pentagon* on a given line A B.

From B erect B C perpendicular to and half the length of A B; join A and C prolonged to D; with C as a center and C B as radius, draw the arc B D; then the chord B B is the radius of the circle circumscribing the pentagon. With A and B as centers, and B D as radius, draw the cross O in the center.

35.

To construct a pentagon on a given line A B without resort to its center.

From B erect B o perpendicular and equal to A B; with C as center and C o as radius, draw the arc D o; then A D is the diagonal of the pentagon. With A D as radius and A as center, draw the arc D E; and with E as center and A B as radius, finish the cross E, and thus complete the pentagon.

36.

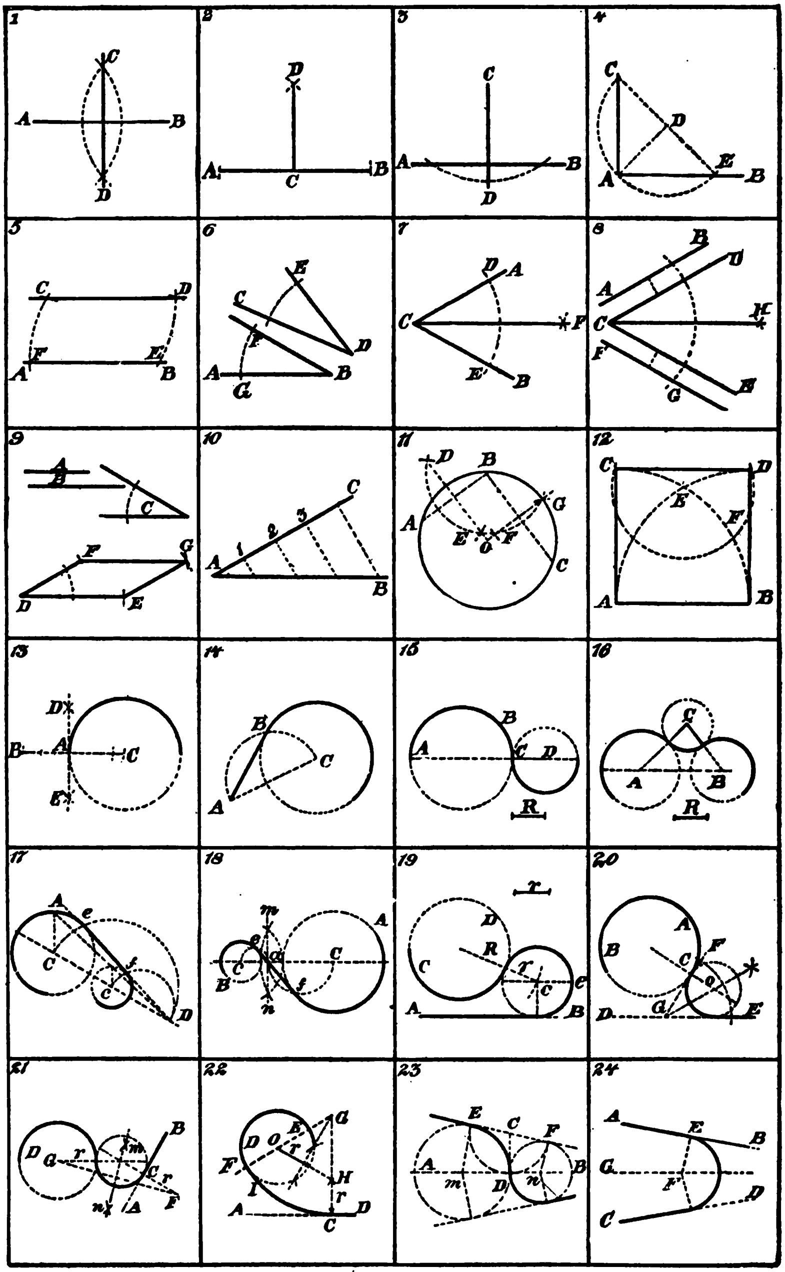
To construct a *hexagon* in a given circle.

The radius of the circle is equal to the side of the hexagon.

37.

To construct a Heptagon.

The appotem a in a hexagon is the length of the side of the heptagon.



Set off *A B* equal to the radius of the circle; draw *a* from the center *C* at right angles to *A B;* then *a* is the required side of the heptagon.

38.
To construct an *octagon* on the given line *A B.*
Prolong *A B* to *C*. With *B* as center and *A B* as radius, draw the circle *A F D E C;* from *B*, draw *B I* at right angles to *A B;* divide the angles *A B D* and *D B C* each into two equal parts; then *B E* is one side of the octagon. With *A* and *E* as centers, draw the arcs *H K E* and *A K I*, which determine the points *H* and *I*, and thus complete the octagon as shown in the illustration.

39.
To cut off the corners of a square, so as to make of it a regular *octagon*.
With the corners as centers, draw circle arcs through the center of the square to the side, which determines the cut-off.

40.
The area of a regular polygon is equal to the area of a triangle whose base is equal to the sum of all the sides, and the height *a* equal to the appotem of the polygon.
The reason of this is that the area of two or more triangles *A B C* and *A D C* having a common or equal base *b* and equal height *h* are alike.

41.
To construct any regular *polygon* on a given line *A B* without resort to its center.
Extend *A B* to *C* and, with *B* as center, draw the half circle *A D B*. Divide the half circle into as many parts as the number of sides in the polygon, and complete the construction as shown on the illustration.

42.
To construct an isometric ellipse by compasess and six circle arcs.
Divide *O A* and *O B* each into three equal parts; draw the quadrant *A C*. From *C*, draw the line *C c* through the point 1. Through the points 2 draw *d e* at an angle of 45° with the major axis. Then 2 is the center for the ends of the ellipse; *e* is the center for the arc *d c;* and *C* is the center for the arc *c f.*

43.
To construct a Hyperbola by plotting,

Having given the transverse axis *B C*, vertexes *A a*, and foci *f f'*. Set off any desired number of parts on the axis below the focus, and number them 1, 2, 3, 4, 5, etc. Take the distance *a* 1 as radius, and, with *f'* as center, strike the cross 1 with *f'* 1 = *a* 1. With the distance *A* 1, and the focus *f* as center, strike thé cross 1 with the radius *F* 1 = *A* 1, and the cross 1 is a point in the hyperbola.

44.
To draw an Hyperbola by a pencil and a string,
Having given the transverse axis *B C*, foci *f'* and *f*, and the vertexes *A* and *a*. Take a rule and fix it to a string at *e;* fix the other end of the string at the focus *f*. The length of the string should be such that when the rule *R* is in the position *f'C*, the loop of the string should reach to *A;* then move the rule on the focus *f'*, and a pencil at *P*, stretching string, will trace the hyperbola.

45.
To construct a Parabola by plotting,
Having given the axis, vertex, and focus of the parabola. Divide the transverse axis into any desired number of parts 1, 2, 3, etc., and draw ordinates through the divisions; take the distance *A* 1, and set it off on the 1st ordinate from the focus *f* to *a*, so that *A* 1 = *f a*. Repeat the same operation with the other ordinates—that is, set off the distance *A* 5 from *f* to *e*, so that *A* 5 = *f e;* and so the parabola is constructed.

46.
To draw a Parabola with a pencil and a string,

Having given the two axes, vertex, and focus of the parabola. Take a square *c d e*, and fix to it a string at *c;* fix the other end of the string at the focus *f*. The length of the string should be such that when the square is in the position of the axis *A f*, the string should reach to the vertex *A*. Move the square along *B B*, and the pencil *P* will describe the parabola.

47.
Schiele's anti-friction curve.

R represents the radius of the shaft, and *C* 1, 2, 3, etc., is the center line of the shaft. From *o*, set off the small distance *o a;* and set off *a* 1 = *R*. Set off the same small distance from *a* to *b*, and make *b* 2 = *R*. Continue in the same way with the other points, and the anti-friction curve is thus constructed.

48.
Isometric Perspective.

This kind of perspective admits of scale measurements the same as any ordinary drawing, and gives a clear representation of the object. It is easily learned. All horizontal rectangular lines are drawn at an angle of 30°.
All circles are ellipses of proportion, as shown in No. 42, on the following page.

49.
To construct an ellipse.

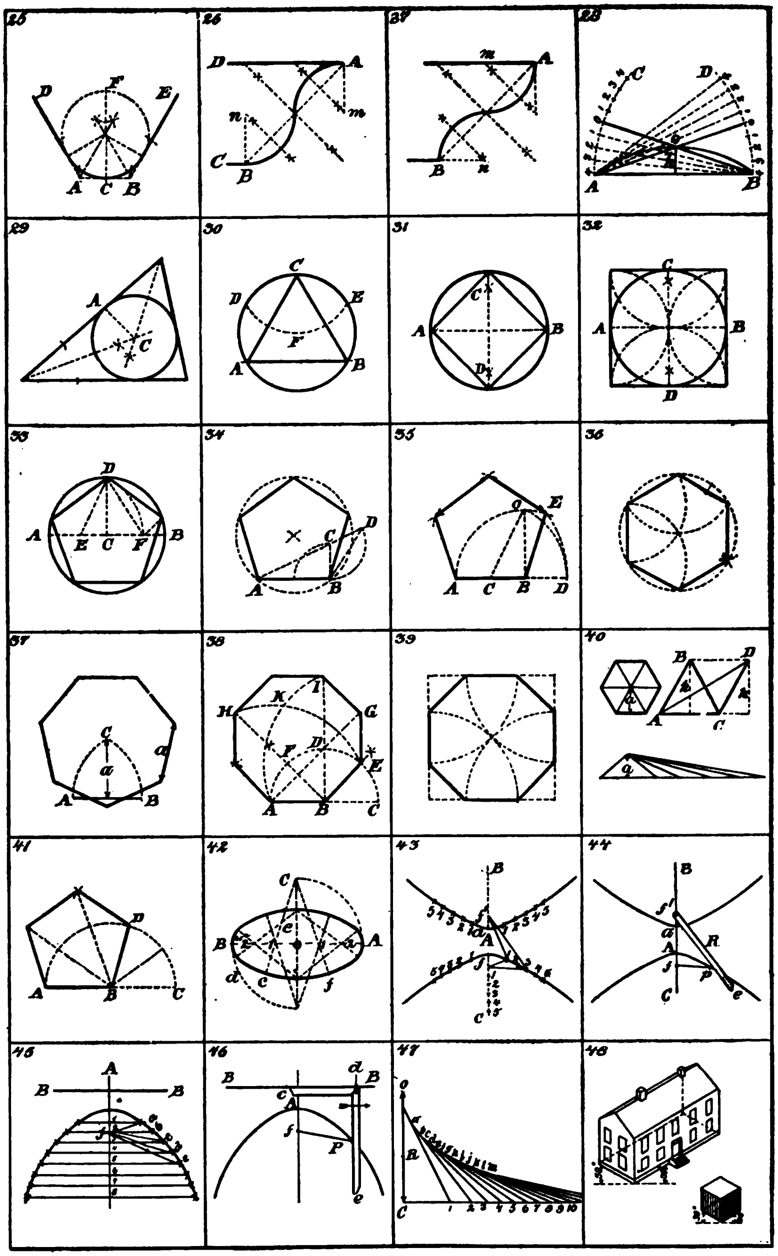
With *a* as a center, draw two concentric circles with diameters equal to the long and short axes of the desired ellipse. Draw from *o* any number of radii, *A*, *B*, etc. Draw a line *B b'* parallel to *n* and *b b'* parallel to *m*, then *b* is a point in the desired ellipse.

50.
To draw an ellipse with a string.

Having given the two axes, set off from *c* half the great axis at *a* and *b*, which are the two focuses of the ellipse. Take an endless string as long as the three sides in the triangle *a b c*, fix two pins or nails in the focuses, one in *a* and one in *b*, lay the string around *a* and *b*, stretch it with a pencil *d*, which then will describe the desired ellipse.

51.
To draw an ellipse by circle arcs.

Divide the long axis into three equal parts, draw the two circles, and where they intersect one another are the centers for the tangent arcs of the ellipse as shown by the figure.



52.

To draw an ellipse by circle arcs.

Given the two axes, set off the short axis from A to b, divide b into three equal parts, set off two of these parts from o towards c and c which are the centers for the ends of the ellipse. Make equilateral triangles on $c\,c$, when $e\,e$ will be the centers for the sides of the ellipse. If the long axis is more than twice the short one, this construction will not make a good ellipse.

53.

To construct an ellipse.

Given the two axes, set off half the long axis from c to $f\,f$, which will be the two focuses in the ellipse. Divide the long axis into any number of parts, say a to be a division point. Take $A\,a$ as radius and f as center and describe a circle arc about b, take $a\,B$ as radius and f as center describe another circle arc about b, then the intersection b is a point in the ellipse, and so the whole ellipse can be constructed.

54.

To draw an ellipse that will tangent two parallel lines in A and B.

Draw a semicircle on $A\,B$, draw ordinates in the circle at right angle to $A\,B$, the corresponding and equal ordinates for the ellipse to be drawn parallel to the lines, and thus the elliptic curve is obtained as shown by the figure.

55.

To construct a cycloid.

The circumference $C=3.14\,D$. Divide the rolling circle and base line C into a number of equal parts, draw through the division point the ordinates and abscissas, make $a\,a'=1\,d$, $b\,b'=2'e$, $c\,c=3\,f$, then $a\,b'$ and c' are points in the cycloid. In the *Epicycloid* and *Hypocycloid* the abscissas are circles and the ordinates are radii to one common center.

56.

Evolute of a circle.

Given the pitch p, the angle v, and radius r. Divide the angle v into a number of equal parts, draw the radii and tangents for each part, divide the pitch p into an equal number of equal parts, then the first tangent will be one part, second two parts, third three parts, etc., and so the *Evolute* is traced.

57.

To construct a spiral with compasses and four centers.

Given the pitch of the spiral, construct a square about the center, with the four sides together equal to the pitch. Prolong the sides in one direction as shown by the figure, the corners are the centers for each arc of the external angles.

58.

To construct a Parabola.

Given the vertex A, axis x, and a point P. Draw $A\,B$ at right angle to x, and $B\,P$ parallel to x, divide $A\,B$ and $B\,P$ into an equal number of equal parts. From the vertex A draw lines to the divisions on $B\,P$, from the divisions on $A\,B$ draw the ordinates parallel to x, the corresponding intersections are points in the *parabola*.

59.

To construct a Parabola.

Given the axis of ordinate B, and vertex A. Take A as a center and describe a semicircle from B which gives the focus of the *parabola* at f. Draw any ordinate y at right angle to the abscissa $A\,x$, take a as radius and the focus f as a center, then intersect the ordinate y, by a circle-arc in P which will be a point in the *parabola*. In the same manner the whole Parabola is constructed.

60.

To draw an arithmetic spiral.

Given the pitch p and angle v, divide them into an equal number of equal parts, say 6: make $0\,1=0\,1$, $0\,2=0\,2$, $0\,3=0\,3$, $0\,4=0\,4$, $0\,5=0\,5$, and $0\,6=$ the pitch p; then join the points 1, 2, 3, 4, 5 and 6, which will form the spiral required.

THE CIRCLE.

Notation of Letters.

$d=$ diameter of the circle.
$r=$ radius of the circle.
$p=$ periphery or circumference.
$a=$ area of a circle or part thereof.
$b=$ length of a circle arc.
$c=$ chord of a segment, length of.
$h=$ height of a segment.
$s=$ side of a rectangular polygon
$v=$ center angle.
$w=$ polygon angle.

All measures must be expressed by the same unit.

FORMULAS FOR THE CIRCLE.

Periphery or Circumference.

$$p=\pi\,d=3.14d.$$

$$p=2\pi\,r=6.28r.$$

$$p=2\sqrt{\pi\,a}=3.54\sqrt{a}.$$

$$p=\frac{2a}{r}=\frac{4a}{d}.$$

Diameter and Radius.

$$d=\frac{p}{\pi}=\frac{p}{3.14}.$$

$$r=\frac{p}{2\pi}=\frac{p}{6.28}.$$

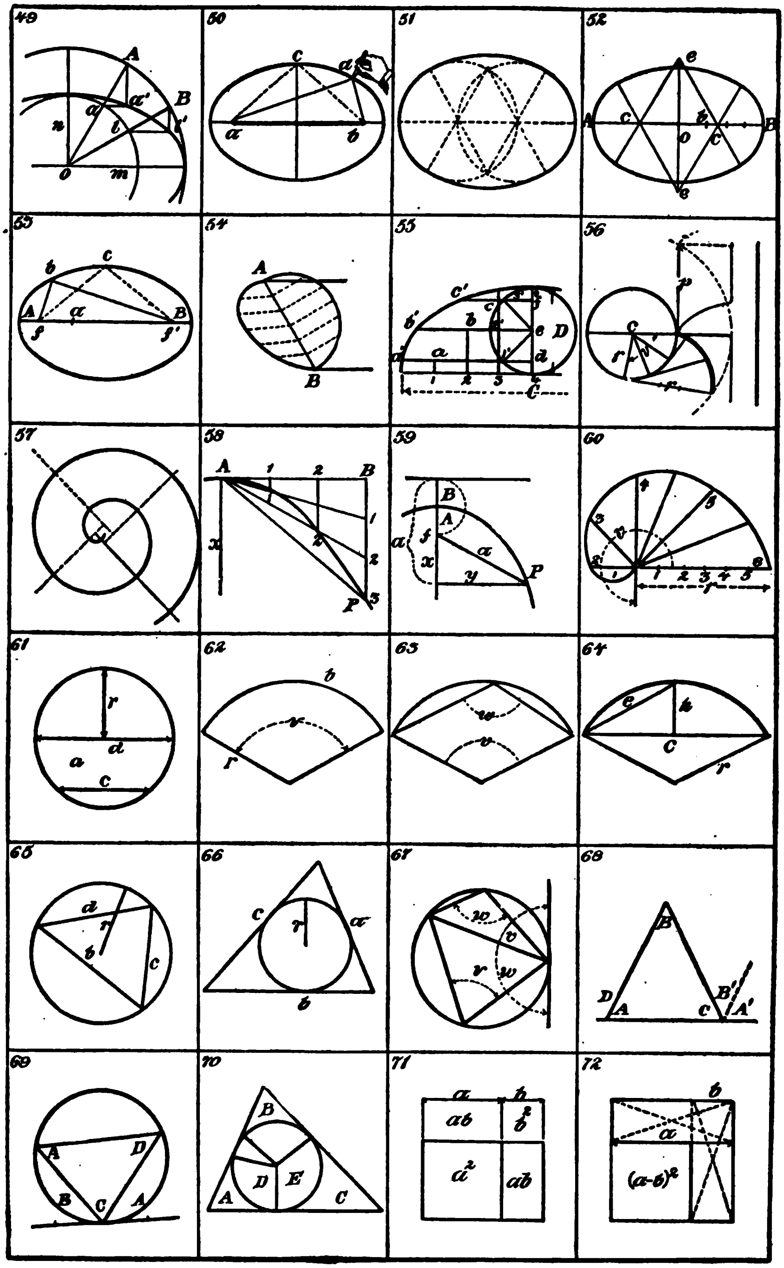
$$d=2\sqrt{\frac{a}{\pi}}=1.128\sqrt{a}$$

$$r=\sqrt{\frac{a}{\pi}}=0.564\sqrt{a}.$$

Area of the Circle.

$$a=\frac{\pi\,d^2}{4}=0.785d^2$$

$$a=\pi\,r^2=3.14r^2.$$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ab
ab
(a-b)²

$$a=\frac{p^2}{4\pi}=\frac{p^2}{12.56}.$$

$$a=\frac{pr}{2}=\frac{pd}{4}.$$

$\pi=3.14159265358979323846264338327950288$
4197169399

$2\pi=6.283185$
$3\pi=9.424778$
$4\pi=12.566370$
$5\pi=15.707963$
$6\pi=18.849556$
$7\pi=21.991148$
$8\pi=25.132741$
$9\pi=28.274334$
$\frac{1}{4}\pi=0.785398$
$\frac{1}{3}\pi=1.047197$
$\frac{1}{2}\pi=1.570796$
$\frac{1}{8}\pi=0.392699$
$\frac{1}{6}\pi=0.523599$
$\frac{1}{12}\pi=0.261799$
$\frac{2}{3}\pi=2.094394$
$\frac{1}{360}\pi=0.008726$

$\frac{1}{\pi}=0.318310$

$\frac{2}{\pi}=0.636619$

$\frac{3}{\pi}=0.954929$

$\frac{4}{\pi}=1.273239$

$\frac{6}{\pi}=1.909859$

$\frac{8}{\pi}=2.546478$

$\frac{12}{\pi}=3.819718$

$\frac{360}{\pi}=114.5915$

$\pi^2=9.869650$
$\sqrt{\pi}=1.772453$

$\sqrt{\frac{1}{\pi}}=0.564189$

$\sqrt{\frac{\pi}{2}}=1.253314$

$\sqrt{\frac{2}{\pi}}=0.797884$

Log. $\pi=0.49714987$

61.
The periphery of a Circle is commonly expressed by the *Greek* letter $\pi=3.14$ when the diameter $d=1$ or the unit. For any other value of the diameter d, we will denote the periphery by the letter p, r = radius, and a = area of the circle. The periphery of a circle is equal to 3 14-100 times its diameter. c = chord.

62.

$$b=\frac{\pi r v}{180}=0.0175rv,$$

$$v=\frac{180b}{\pi r}=57.296\frac{b}{r}.$$

63.

$$w=180-\frac{v}{2},$$

$$v=2(180^\circ-w).$$

64.

$$r=\frac{c^2+4h^2}{8h}=\frac{e^2}{2h},$$

$$c=2\sqrt{2hr-h^2}.$$

65.

$$r=\frac{ac}{2\sqrt{a^2-\left(\frac{a^2+b^2-c^2}{2b}\right)^2}}.$$

66.

$$r=\frac{b\sqrt{a^2-\left(\frac{a^2+b^2-c^2}{2b}\right)^2}}{a+b+c}.$$

67.

$v=v,\quad w=w,$

$w+v=180^\circ,\ w>v.$

68.

$D=B+C,\quad A'+B'+C=180^\circ,$
$B=D-C,\quad A+B+C=180^\circ,$
$A'=A,\quad B'=B.$

69.

$A+B+C=180^\circ,$

$A'=A,\quad B'=B.$

70.

$E+C=A+D=180^\circ,$

$D=B+c,$

$E=A+B.$

71. $(a+b)^2=a^2+2ab+b^2.$

72. $(a-b)^2=a^2-2ab+b^2.$

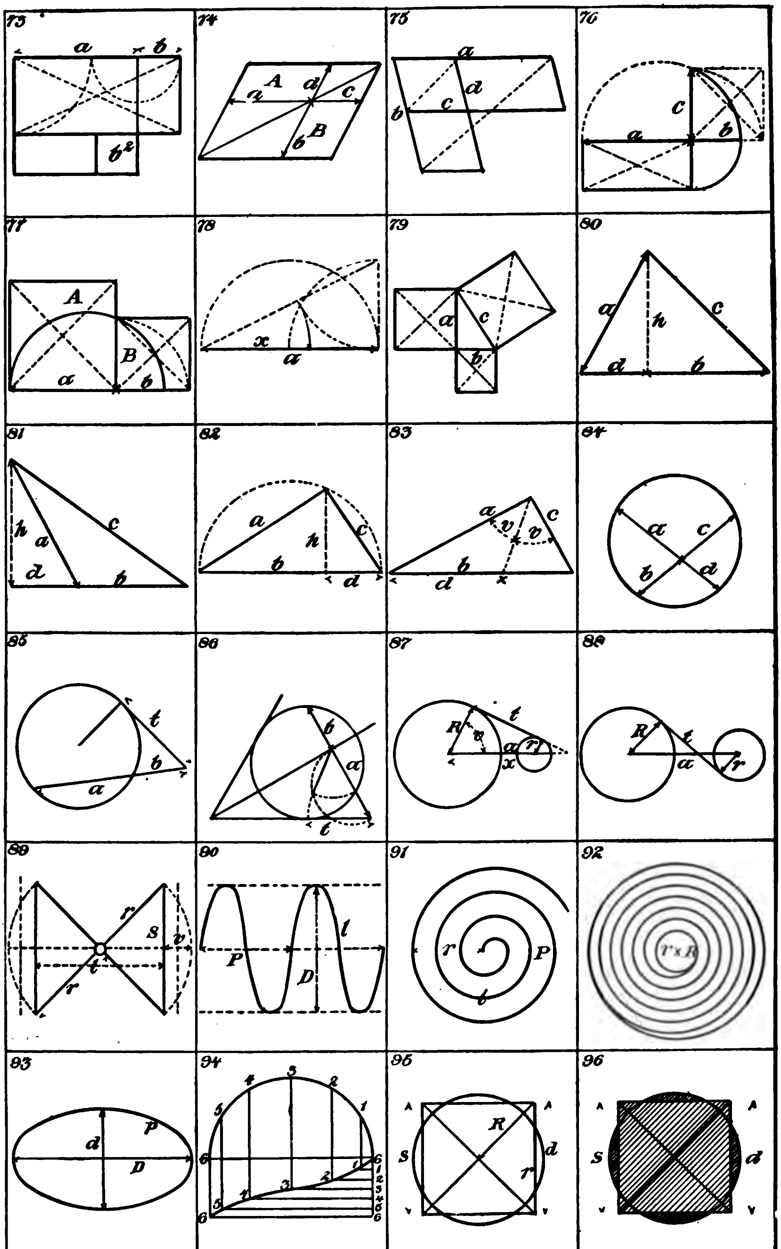
73. $(a+b)\ (a-b)=a^2-b^2.$

74.

$a:b=c:d,$

$ad=bc,$

$A=B.$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75. $a : b = c : d,$
$ad = bc.$

76. $a : c = c : b,$
$ab = c^2,$
$c = \sqrt{ab}.$

77. $A : B = a : b.$

78. $a ; x = x : a - x,$
$$x = \sqrt{a^2 + \left(\frac{a}{2}\right)^2} - \frac{a}{2}$$

79. $c^2 = a^2 + b^2,$
$a^2 = c^2 - b^2,$
$b^2 = c^2 - a^2.$

80. $c^2 = a^2 + b^2 - 2bd,$
$h = \sqrt{a^2 - d^2}.$
$$d = \frac{a^2 + b^2 - c^2}{2b}.$$

81. $c^2 = a^2 + b^2 + 2bd,$
$h^2 = \sqrt{a^2 - d^2},$
$$d = \frac{c^2 - a^2 - b^2}{2b}.$$

82. $a : b = h : c,$
$$h = \frac{ac}{b} = \frac{ad}{c},$$
$$d = \frac{c^2}{b} = \frac{ch}{a}.$$

83. $a : c = d : (b - d),$
$$d = \frac{ab}{c + a},$$
$v = v.$

84. $a : c = b : d,$
$ad = bc.$

85. $a : t = t : b,$
$t^2 = ab.$

86. $t^2 = (a + b)\ (a - b),$
$t = \sqrt{a^2 - b^2}.$

87. $$x = \frac{aR}{R - r},\quad a = \sqrt{t^2 + (R - r)^2},$$
$$t = \sqrt{a^2 - (R - r)^2},\quad \sin.v = \frac{t}{a}.$$

88. $t = \sqrt{a^2 - (R + r)^2},$
$a = \sqrt{t^2 + (R + r)^2}.$

89. $$V = r - \sqrt{r^2 - \frac{S^2}{4}}\qquad l = 2r - V,$$
$$S = 2\sqrt{r^2 - (r - V)^2}.\quad r = \tfrac{1}{2}(l + V).$$

90. $$P = \sqrt{\frac{l^2}{n^2} - \pi^2 d^2},$$
$l = n\ \sqrt{\pi^2 d^2 + P^2},$
$$n = \frac{l}{\sqrt{\pi^2 d^2 + P}.}$$

91. *To find the length of a Spiral.*
$$l = \pi r n = \frac{\pi r^2}{P},\quad n = \frac{l}{\pi r} = \frac{r}{P},$$
$$P = \frac{\pi r^2}{l} = \frac{r}{n}.\quad P = \textit{Pitch}.$$

92. *To find the length of a Spiral.*
$l = \pi\ n\ (R + r),$
$$l = \frac{\pi}{P}(R^2 - r^2).$$

93. *Periphery of an Ellipse.*
$p = 2\sqrt{D2 + 1.4674d^2}.$

94. To construct a screw *Helix.*

95. *To square a Circumference.*
$R = 0.555355\ d = 1.1107\ r = 0.7071\ S.$
$S = 0.785398\ d = 1.57079\ r = 1.4142\ R$
$d = 1.27322\ S = 1.79740\ R = 2r.$

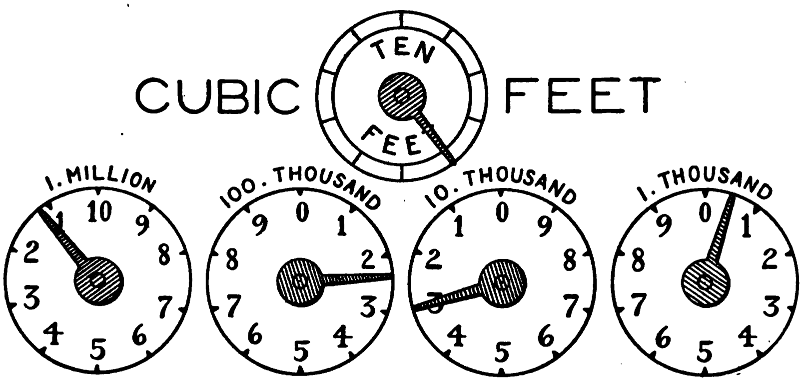
96. *To square a Circleplane.*
$R = 0.626657\ d = 1.253314\ r = 0.7071\ S$
$S = 0.886226\ d = 1.77245\ r = 1.4142\ R$
$d = 1.12838\ S = 1.5367\ R = 2\ r.$

CHAPTER VI.

WEIGHTS AND MEASURES.

HOW TO READ A GAS METER.

The dial marked "1 THOUSAND" in the accompanying illustration is divided into hundreds; the dial marked "10 THOUSAND" is divided into thousands; that marked "100 THOUSAND" into ten-thousands, and that marked "1 MILLION" into hundred-thousands. When 1,000 cubic feet of gas have been consumed, the pointer on the dial marked "1 THOUSAND" will have made a complete rotation and the fact will be indicated by the pointer of the next dial at the left, which will point to the figure 1. When 10,000 cubic feet of gas have been consumed, the pointer on the "10 THOUSAND" dial will point to 1, and so on. In reading a gas meter, put down the hundreds first, then the thousands, and so on, always counting the figure just under, or which has just been passed by, the pointer. In the illustration about half a hundred is indicated on the "1 THOUSAND" dial, three thousands is indicated on the next dial, two ten-thousands on the next dial, and one one-hundred-thousands on the "1 MILLION" dial. The reading will be 123,-050. The dial marked "TEN FEET" is called the units dial. It is used for testing the meter to discover whether it is in working order or not. Each mark represents a cubic foot and the complete circle 10 cubic feet. If the pointer moves when no gas is burning, it indicates a leak. If it does not move when the gas is burning, or if its motion is unsteady, it indicates a derangement in the mechanism and shows that the meter requires attention.



GAS METER INDICATOR DIALS.

WEIGHTS AND MEASURES.

LINEAR MEASURE.

3 barleycorns, or... 13 lines, or... 72 points, or... 1,000 mils (mi.)...	1 inch (in.)
3 inches	1 palm
4 inches	1 hand
9 inches	1 span
12 inches	1 foot (ft.)
18 inches	1 cubit
3 feet	1 yard (yd.)
2½ feet	1 military pace
5 feet	1 geometrical pace
2 yards	1 fathom
5½ yards	1 rod, pole, or perch
66 feet, or... 4 rods	1 Gunter's chain
40 poles, or... 220 yards	1 furlong (fur.)
8 furlongs, or... 1,760 yards, or... 5,280 feet	1 mile
3 miles	1 league

The hand is used to measure horses' height. The military pace is the length of the ordinary step of a man. One thousand geometrical paces were reckoned to a mile.

LAND MEASURE (LINEAR).

7.92 inches	1 link
100 links, or... 66 feet, or... 22 yards, or... 4 poles	1 chain (ch.)
10 chains	1 furlong (fur.)
80 chains, or... 8 furlongs	1 mile

LAND MEASURE (SQUARE).

144 sq. inches	1 square foot (sq. ft.)
9 square feet	1 square yard (sq. yd.)
30¼ sq. yards	1 sq. pole, rod, or perch
16 sq. poles	1 square chain (sq. ch.)
40 sq. poles, or 1,210 sq. yards	1 sq. rood
4 roods, or... 10 sq. chs., or... 160 sq. poles, or. 4,840 sq. yds., or... 43,560 sq. ft.	1 acre*
640 acres, or... 3,097,600 sq. yds	1 sq. mile
30 acres	1 yard of land
100 acres	1 hide of land
40 hides	1 barony

* The side of a square having an area of an acre is equal to 69.57 linear yards.

CUBIC MEASURE.

1,728 cubic inches	1 cubic foot
27 cubic feet	1 cubic or solid yard

DRY MEASURE, U. S.

		Cu. In.
2 pints	1 quart (qt.)	= 67.20
4 quarts	1 gallon (gal.)	= 268.80
2 gallons, or... 8 quarts	1 peck	= 537.60
4 pecks	1 struck bushel	= 2150.42

LIQUID MEASURE, U. S.

		Cu. In.
4 gills	1 pint (O.)	= 28.875
2 pints	1 quart (qt.)	= 57.75
4 quarts	1 gallon (gal.)	= 231
63 gallons	1 hogshead (hhd.)	
2 hogsheads	1 pipe or butt	
2 pipes	1 tun	

APOTHECARIES' LIQUID MEASURE.

Apothecaries' or Wine Measure is used by pharmacists of this country. Its denominations are gallon, pint, fluid ounce, fluid drachm, and minim, as follows:

Cong.		O.		F. Oz.		F. Dr.		Minims
1	=	8	=	128	=	1,024	=	61,440
		1	=	16	=	128	=	7,680
				1	=	8	=	480
						1	=	60
								1

The Imperial Standard Measure is used by British pharmacists. Its denominations and their relative value are:

Gal.		Quarts.		Pints.		F. Oz.		F. Dr.		Minims
1	=	4	=	8	=	160	=	1,280	=	76,800
		1	=	2	=	40	=	320	=	19,200
				1	=	20	=	160	=	9,600
						1	=	8	=	480
								1	=	60

The relative value of United States Apothecaries' and British Imperial Measures is as follows:

U. S. Apothecaries' Measure.		Imperial Measure. Pints.	F. Oz.	F. Dr.	Minims
1 Gallon	= .83311 Gallon, or	6	13	2	22.85
1 Pint	= .83311 Pint, or		16	5	17.86
1 Fl. Oz.	= 1.04139 Fl. Oz., or		1	0	19.86
1 Fl. Dr.	= 1.04139 Fl. Dr. or			1	2.48
1 Minim	= 1.04139 Minim, or				1.04

OLD WINE AND SPIRIT MEASURE.

		Imperial Gals.
4 gills or quarterns	1 pint	
2 pints	1 quart	
4 quarts (231 cu. in.)	1 gallon	= .8333
10 gallons	1 anchor	= 8.333
18 gallons	1 bunlet	= 15
31½ gallons	1 barrel	= 26.25
42 gallons	1 tierce	= 35
63 gallons, or... 2 barrels	1 hogshead	= 52.5
84 gallons, or... 1⅓ hogsheads	1 puncheon	= 70
126 gallons, or... 2 hogsheads, or... 1½ puncheons	1 pipe or butt	= 105
2 pipes or... 3 puncheons	1 tun	= 210

Apothecaries' Weight is the official standard of the United States Pharmacopœia. In buying and selling medicines not ordered by prescriptions avoirdupois weight is used.

Lb.		Oz.		Dr.		Scr.		Gr.
1	=	12	=	96	=	288	=	5760
		1	=	8	=	24	=	480
				1	=	3	=	60
						1	=	20

WEIGHTS AND MEASURES—*Continued*

Avoirdupois Weight.—Used for weighing all goods except those for which troy and apothecaries' weight are employed.

Gross or Long Ton.	Cwt.	Qr.	Lb.	Oz.	Dr.
1 =	20 =	80 =	2,240 =	35,840 =	573,440
	1 =	4 =	112 =	1,792 =	28,672
		1 =	28 =	448 =	7,168
			1 =	16 =	256
				1 =	16

Short or Net Ton.	Cwt.	Qr.	Lb.	Oz.	Dr.
1 =	20 =	80 =	2,000 =	32,000 =	512,000
	1 =	4 =	100 =	1,600 =	25,600
		1 =	25 =	400 =	6,400
			1 =	16 =	256
				1 =	16

The "short" ton of 2,000 lbs. is used commonly in the United States. The British or "long" ton, used to some extent in the United States, contains 2,240 lbs., corresponding to a cwt. of 112 and a quarter of 28 lbs.

Troy Weight.—Used by jewelers and at the mints, in the exchange of the precious metals.

Lb.	Oz.	Dwt.	Gr.
1 =	12 =	240 =	5760
	1 =	20 =	480
		1 =	24

700 troy grains = 1 lb. avoirdupois.
175 troy pounds = 144 lb. avoirdupois.
175 troy ounces = 192 oz. avoirdupois.
437½ troy grains = 1 oz. avoirdupois.
1 troy pound = .8228 + lb. avoirdupois.

The common standard of weight by which the relative values of these systems are compared is the grain, which for this purpose may be regarded as the unit of weight. The pound troy and that of apothecaries' weight have each five thousand seven hundred and sixty grains; the pound avoirdupois has seven thousand grains.

The relative proportions and values of these several systems are as follows:

Troy.	Avoirdupois. Oz.	Dr.
1 pound equals	13	2.65
1 ounce equals	1	1.55
1 dwt. equals	0	0.877

Troy.	Apothecaries'. Lb.	Oz.	Dr.	Sc.	Gr.
1 pound equals	1	0	0	0	0
1 ounce equals	0	1	0	0	0
1 dwt. equals	0	0	0	1	4
1 grain equals	0	0	0	0	1

Apothecaries'.	Avoirdupois. Oz.	Dr.
1 pound equals	13	2.65
1 ounce equals	1	1.55
1 drachm equals	0	2.19
1 scruple equals	0	0.73

Apothecaries'.	Troy. Lb.	Oz.	Dwt.	Gr.
pound equals	1	0	0	0
ounce equals	0	1	0	0
drachm equals	0	0	2	12
scruple equals	0	0	0	20

Avoirdupois.	Troy. Lb.	Oz.	Dwt.	Gr.
1 long ton equals	2722	2	13	8
1 cwt. equals	136	1	6	16
1 quarter equals	34	0	6	16
1 pound equals	1	2	11	16
1 ounce equals		0	18	5½
1 drachm equals		0	1	3 11/32

Avoirdupois.	Troy. Lb.	Oz.	Dwt.	Gr.
1 short ton equals	2430	6	13	8
1 cwt. equals	121	6	6	16
1 quarter equals	30	4	11	16

Avoirdupois.	Apothecaries'. Lb.	Oz.	Dr.	Scr.	Gr.
1 pound equals	1	2	4	2	0
1 ounce equals	0	0	7	0	17½
1 drachm equals	0	0	0	1	7 11/32

DIAMOND MEASURE.

16 parts = 1 grain = 0.8 troy grain.
4 grains = 1 carat = 3.2 troy grains.

TIME.

The unit of time measurement is the same among all nations. Practically it is 1/86400 of the mean solar day, but really it is a perfectly arbitrary unit, as the length of the mean solar day is not constant for any two periods of time. There is no constant natural unit of time.

1 minute	= 60 seconds.
1 hour	= 60 minutes, 3600 seconds.
1 day	= 24 hours, 1440 minutes, 86,400 seconds.
1 sidereal day	= 86164.1 seconds.
1 sidereal month	= 27.321661 mean solar days (average).
1 lunar month	= 29.530589 mean solar days (average).
1 anomalistic month	= 27.544600 mean solar days (average).
1 tropical month	= 27.321582 mean solar days (average).
1 nodical month	= 27.212222 mean solar days (average.)
Mean solar year	= 365 d. 5 h. 48 m. 46.045 s. with annual variation of 0.00539.

The change in the length of the mean sidereal day, i.e., of the time of the earth's rotation upon its axis, amounts to 0.01252 s. in 2400 mean solar years.

ANGULAR MEASURE

60 seconds = 1 minute
60 minutes = 1 degree
60 degrees = 1 sextant
90 degrees = 1 right angle or quadrant
360 degrees = 1 circle

GEOGRAPHICAL MEASURE

6087.15	feet = 1 geographical mile
1.15287	statute miles = 1 geographical mile
60	geographical miles = 1 degree of longitude at the Equator
69.168	statute miles = 1 degree of longitude at the Equator
360	degrees = circumference of earth at the Equator

WEIGHTS AND MEASURES—*Continued*

NAUTICAL MEASURE

6	feet = 1 fathom
120	fathoms = 1 cable length
6080.27	feet = 1 nautical mile
1000	fathoms = 1 nautical mile
1.15157	statute miles = 1 nautical mile
3	nautical miles = 1 league
1	knot = a speed of 1 nautical mile per hour

In the United States the nautical mile is defined to be one sixtieth part of the length of a degree of a great circle of a sphere whose surface is equal in area to the area of the surface of the earth. In France, Germany and Austria the nautical mile has a length of 6,076.23 feet. In England the nautical mile is 6,080 feet.

Miles at sea are understood to be nautical miles. Therefore it is no more necessary to say "nautical" miles when speaking of a sea distance than to say "statute" miles when speaking of a land distance.

Landsmen are apt to confuse knots with nautical miles. A knot is not a measure of distance but a measure of speed, and the only measure of speed in the English language. When speaking of a vessel that travels, say 20 knots, we mean that the vessel is traveling at a speed of 20 nautical miles per hour; but the distance covered may be one nautical mile or a thousand, depending upon the length of time during which the 20-knot speed is maintained. Only landsmen use the expression "knots per hour." The "per hour" is superfluous and incorrect.

Following is a list of the lighthouses from Bremerhaven to Dover; figures expressed in sea miles. There is no table in existence which exactly corresponds with the excellent tables which we give from Fastnet Light to Flushing.

Hoheweg-Lighthouse	17
Rothesand-Lighthouse	26
Weser-Lightship	35
Borkum Lightship	100
Terschelling Lightship	146
Dover	340

PERPETUAL CALENDAR.

To find the day of the week for any given date.

1. Take the last two figures of the year, add ¼ of them (neglecting remainder). Thus: 1949=49+12=61.

2. Add for the month, if for Jan. or Oct., 1; May, 2; Aug., 3; Feb., Mar., or Nov., 4; June, 5; Sept. or Dec., 6; April or July, 0; if leap year (that is, if it be divisible by 4 without remainder) Jan., 0; Feb., 3.

3. Add day of month.

Divide the sum of these three by 7, and *remainder* gives the number of the day of the week.

Thus:—

What day of the week is 15th July, 1908?

1. 8 + 2 = 10
2. July = 0
3. 15th = 15

25 = 7 × 3 + *4*.

4th day of the week = Wednesday.

What day of the week was December 25th, 1905?

1. 5 + 1 = 6
2. Dec. = 6
3. 25th = 25

37 = 7 × 5 + *2*.

2nd day of the week = Monday.

The above only applies to 20th Century. For 19th Century, add 2, for 21st Century, add 6, 18th Century, 4, but before 1752 the "old style" was used.

DISTANCES IN DETAIL OF AMERICAN LIGHTS.

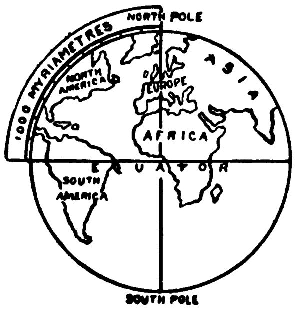
	Knots
New York to Sandy Hook	18
Sandy Hook to Ambrose Lightship	8
Ambrose Lightship to Fire Island	30
Fire Island to Shinnecock	35
Shinnecock to Nantucket Lightship	122

TABLE FOR CONVERTING NAUTICAL MILES TO STATUTE MILES.

Nautical Miles	Statute Miles	Nautical Miles	Statute Miles	Nautical Miles	Statute Miles	Nautical Miles	Statute Miles
1	1.152	14	16.122	27	31.092	40	46.063
2	2.303	15	17.274	28	32.244	41	47.214
3	3.455	16	18.425	29	33.396	42	48.366
4	4.606	17	19.577	30	34.547	43	49.518
5	5.758	18	20.728	31	35.699	44	50.670
6	6.909	19	21.880	32	36.850	45	51.821
7	8.061	20	23.031	33	38.002	46	52.972
8	9.213	21	24.183	34	39.153	47	54.124
9	10.364	22	25.335	35	40.305	48	55.275
10	11.516	23	26.486	36	41.457	49	56.427
11	12.667	24	27.638	37	42.608	50	57.578
12	13.819	25	28.789	38	43.760		
13	14.970	26	29.941	39	44.911		

DECIMAL SYSTEM—WEIGHTS AND MEASURES.

A *meter* is one ten-millionth of the distance from the equator to the North Pole.



The metric system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. The *are*, the unit of surface, is the square of ten meters. The *liter*, the unit of capacity, is the cube of a tenth part of the meter. The *stere*, the unit of solidity, has the capacity of a cubic meter. The *gram*, the unit of weight, is the weight of that quantity of distilled water at its maximum density which fills the cube of a hundredth part of the meter. Each unit has its decimal multiple and submultiple, that is, weights and measures ten times larger or ten times smaller than the principal unit. The prefixes denoting the multiples are derived from the Greek, and are *deca*, ten; *hecto*, hundred; *kilo*, thousand; and *myria*, ten thousand. Those denoting sub-multiples are taken from the Latin, and are *deci*, ten; *centi*, hundred; *milli*, thousand.

Relative Value.	Length.	Surface.	Capacity.	Solidity.	Weight.
10,000	Myriameter	....	....	....	....
1,000	Kilometer	....	Kiloliter	....	Kilogram
100	Hectometer	Hectare	Hectoliter	....	Hectogram
10	Decameter	....	Decaliter	Dekastere	Decagram
Unit	Meter	Are	Liter	Stere	Gram
0.1	Decimeter	Deciare	Deciliter	Decistere	Decigram
0.01	Centimeter	Centiare	Centiliter	....	Centigram
0.001	Millimeter	....	Milliliter	....	Milligram

APPROXIMATE EQUIVALENTS OF THE FRENCH (METRIC) AND ENGLISH MEASURES.

1 yard	$\frac{11}{12}$ meter.
11 meters	12 yards.
To convert meters into yards	Add $\frac{1}{11}$th.
1 meter = 1.1 yd.; 3.3 ft.	3 ft. 3⅜ inches ([illegible]th less). 40 inches (1.6 per cent less).
1 meter, by the Standards Commission	= 39.38203 inches.
1 meter, by the Act of 1878	= 39.37079 inches.
1 foot	3 decimeters (more exactly 3.048).
1 inch	25 millimeters (more exactly 25.4).
1 mile	1.6 or 1⅗ kilometers (more exactly 1.60931).
1 kilometer	⅝ of a mile.
1 chain (22 yards)	20 meters (more exactly 20.1165).
5 furlongs (1,100 yards)	1 kilometer (more exactly 1.0058).
1 square yard	⅚ square meter (more exactly .8361).
1 square meter	10¾ square feet. 1⅕ square yards.
1 square inch	6½ square centimeters (more exactly 6.45).
1 square mile (640 acres)	260 hectares (0.4 per cent less).
1 acre (4840 square yards)	4000 square meters (1.2 per cent more).
1 cubic yard	¾ cubic meter (2 per cent more).
1 cubic meter	1⅓ cubic yards (1¾ per cent less).
1 cubic meter	35⅓ cubic feet (.05 per cent less).
1 cubic meter of water	1 long ton nearly.
1 kilogram	2.2 pounds fully.
1,000 kilograms 1 metric ton	1 long ton nearly.
1 long hundredweight	51 kilograms nearly.
1 United States hundredweight	45⅓ kilograms nearly.

METRIC MEASURES.

Measures.		Metric to Customary.			Customary to Metric.		
LENGTHS		1 Millimeter	= 0.03937	inch	1 Inch	= 25.4001	millimeters
		1 Centimeter	= 0.3937	"	1 "	= 2.54001	centimeters
		1 Meter	= 39.37	"	1 "	= 0.0254	meter
		1 "	= 3.28083	feet	1 Foot	= 0.304801	"
		1 "	= 1.093611	yards	1 Yard	= 0.914402	"
		1 Kilometer	= 0.62137	mile	1 Mile	= 1.60935	kilometers
AREAS		1 Square Millimeter	= 0.00155	square inch	1 Square Inch	= 645.16	square millimeters
		1 " Centimeter	= 0.1550	" "	1 " "	= 6.452	" centimeters
		1 " Meter	= 10.764	" feet	1 " Foot	= 0.0929	" meter
		1 " "	= 1.1960	" yards	1 " Yard	= 0.8361	" "
		1 " Kilometer	= 0.3861	" mile	1 " Mile	= 2.5900	" kilometers
		1 Hectare	= 2.471	acres	1 Acre	= 0.4047	hectares
VOLUMES		1 Cubic Millimeter	= 0.000061	cubic inch	1 Cubic Inch	= 16,387.2	cubic millimeters
		1 " Centimeter	= 0.0610	" "	1 " "	= 16.3872	" centimeters
		1 " Meter	= 35.314	" feet	1 " Foot	= 0.02832	" meter
		1 " "	= 1.3079	" yard	1 " Yard	= 0.7645	" "
CAPACITY	*Liquid*	1 Liter	= 1.05668	quarts	1 Quart	= 0.94636	liter
		1 "	= 0.26417	gallon	1 Gallon	= 3.78543	"
	Dry	1 Liter	= 0.9081	quart	1 Quart	= 1.1012	liters
		1 "	= 0.11351	peck	1 Peck	= 8.80982	"
		1 Decaliter	= 1.1351	"	1 "	= 0.8810	decaliter
		1 Hectoliter	= 2.83774	bushels	1 Bushel	= 0.35239	hectoliter
MASSES	*Avoirdupois*	1 Gram	= 15.4324	grains	1 Grain	= 0.06480	gram
		1 "	= 0.03527	ounce	1 Ounce	= 28.3495	"
		1 Kilogram	= 2.20462	pounds	1 Pound	= 0.45359	kilogram
	Troy	1 Gram	= 0.03215	ounce	1 Ounce.	= 31.10348	grams
		1 Kilogram	= 2.67923	pounds	1 Pound	= 0.37324	kilogram
	Apothecaries'	1 Gram	= 0.2705	dram	1 Dram	= 3.6967	grams
		1 "	= 0.8115	scruple	1 Scruple	= 1.2322	"

KILOMETRES AND MILES.

Kil.	Miles.	Kil.	Miles.	Kil.	Miles.	Kil.	Miles.
1 = about	⅝	29 = about	18	57 = about	36.1	85 = about	53.3
2 "	1¼	30 "	18⅔	58 "	36.7	86 "	54
3 "	1⅞	31 "	19.7	59 "	37.3	87 "	54⅛
4 "	2½	32 "	20	60 "	38	88 "	55.2
5 "	3.1	33 "	20⅝	61 "	38.9	89 "	55
6 "	3¾	34 "	21.2	62 "	39.2	90 "	56½
7 "	4.7	35 "	21¾	63 "	39¼	91 "	56¾
8 "	5	36 "	22½	64 "	40.4	92 "	57.4
9 "	5⅝	37 "	23 1	65 "	41	93 "	58
10 "	6.2	38 "	23.7	66 "	41.9	94 "	58 1-5
11 "	6¾	39 "	24.3	67 "	42.2	95 "	59¼
12 "	7½	40 "	24.8	68 "	42¼	96 "	59 5-6
13 "	8.1	41 "	25 1-3	69 "	43	97 "	60¼
14 "	8.7	42 "	26½	70 "	43.9	98 "	61.1
15 "	9.3	43 "	27.1	71 "	44.2	99 "	61.8
16 "	10	44 "	27⅓	72 "	44¾	100 "	62.1
17 "	10.9	45 "	28.7	73 "	45⅓	200 "	124.3
18 "	11.2	46 "	29	74 "	46	300 "	186
19 "	11¾	47 "	29⅝	75 "	46.6	400 "	248½
20 "	12.4	48 "	30.2	76 "	47¼	500 "	310.7
21 "	13	49 "	30½	77 "	47 5-6	600 "	372.8
22 "	13.6	50 "	31⅓	78 "	48½	700 "	435
23 "	14¼	51 "	32.7	79 "	49.1	800 "	497.1
24 "	14 5-6	52 "	33	80 "	49.6	900 "	559.1
25 "	15½	53 "	33⅛	81 "	50⅓	1000 "	621.8
26 "	16.1	54 "	34.2	82 "	51½		
27 "	16¾	55 "	34¼	83 "	52.1		
28 "	17.7	56 "	35½	84 "	52.7		

TABLE OF DECIMAL EQUIVALENTS OF FRACTIONS OF AN INCH.

1/64 =	·015625	11/32 =	·34375	43/64 =	·671875
1/32 =	·03125	23/64 =	·359375	11/16 =	·6875
3/64 =	·046875	3/8 =	·375	45/64 =	·703125
1/16 =	·0625	25/64 =	·390625	23/32 =	·71875
5/64 =	·078125	13/32 =	·40625	47/64 =	·734375
3/32 =	·09375	27/64 =	·421875	3/4 =	·75
7/64 =	·109375	7/16 =	·4375	49/64 =	·765625
1/8 =	·125	29/64 =	·453125	25/32 =	·78125
9/64 =	·140625	15/32 =	·46875	51/64 =	·796875
5/32 =	·15625	31/64 =	·484375	13/16 =	·8125
11/64 =	·171875	1/2 =	·50	53/64 =	·828125
3/16 =	·1875	33/64 =	·515625	27/32 =	·84375
13/64 =	·203125	17/32 =	·53125	55/64 =	·859375
7/32 =	·21875	35/64 =	·546875	7/8 =	·875
15/64 =	·234375	9/16 =	·5625	57/64 =	·890625
1/4 =	·25	37/64 =	·578125	29/32 =	·90625
17/64 =	·265625	19/32 =	·59375	59/64 =	·921875
9/32 =	·28125	39/64 =	·609475	15/16 =	·9375
19/64 =	·296875	5/8 =	·625	61/64 =	·953125
5/16 =	·3125	41/64 =	·640625	31/32 =	·96875
21/64 =	·328125	21/32 =	·65625	63/64 =	·984375

WEIGHT OF BELLS.

Kremlin, Moscow, Russia..........	432,000 lbs.
Mengoon, Burmah, India..........	201,600 "
St. Ivans, Moscow, Russia........	127,350 "
Great Bell of Pekin, China........	120,000 "
Maha Ganda, Burmah, India......	95,000 "
Nishni Novgorod, Russia..........	69,664 "
Church of the Redeemer, Moscow, Russia	60,736 "
St. Paul's, London, England......	42,000 "
Olmutz, Bohemia, Austria.........	40,320 "
Vienna, Austria	40,200 "
Westminster, London, England, St. Stephen's Tower, House of Parliament	35,620 "
Erfurt, Saxony, Germany..........	30,800 "
Notre Dame, Paris, France......	28,670 "
Montreal, Canada	28,560 "
City Hall, New York, U. S. A....	22,500 "
Liberty Bell, Philadelphia, U. S. A.	

The three towers of the Houses of Parliament stand up from behind Westminster Hall. On the left next to Westminster Bridge is the Clock Tower (St. Stephen's Tower), (Darlington's London), containing the enormous bell known as "Big Ben."—See Ency. Britannica, p. 539. Big Ben (cracked), bet. 13 and 14 tons.

LENGTH OF CELEBRATED BRIDGES.

NAME.	Longest Span.	Total Length.	Type.	Spanning.
Forth, Scotland..........................	1710	8,296	Cantilever	Firth of Forth
Williamsburg, N. Y......................	1600	7,200	Suspension	East River
Brooklyn, N. Y...........................	1595½	5,986	"	"
Manhattan, N. Y.........................	1470	9,900	"	"
Queensboro, N. Y........................	1182	7,450	Cantilever	"
Niagara (Low Falls), N. Y................	821	1,040	Suspension	Niagara River
Niagara, N. Y............................	550	910	Cantilever	"
Washington Bridge, N. Y.................	509	2,300	Composite	Harlem River
Firth of Tay, Scotland....................	245	10,779	Girder	Firth of Tay

STATUTORY WEIGHTS OF THE BUSHEL.

Courtesy of "International Harvester Company Almanac and Encyclopedia."

STATE OR TERRITORY	Wheat	Rye	Oats	Barley	Buckwheat	Shelled corn	Corn on cob	Cornmeal unbolt	Bran	Malt	Potatoes, Irish	Potatoes, sweet	Carrots	Onions	Turnips, English	Beets	Beans	Peas	Apples	Dried apples	Dried peaches	Castor beans	Flaxseed	Hemp seed	Millet seed	Timothy seed	Blue grass seed	Hungarian grass sd.	Clover seed
United States	60	56	32	48	42	..	..	48	..	34	60	..	..	..	..	..	..	60	..	..	..	50	56	..	..	..	..	..	..
Alabama	60	56	32	47	..	56	70	48	..	..	60	55	..	..	55	..	60	60	..	24	33	..	..	..	..	..	..	..	..
Alaska	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Arizona	60	56	32	45	..	..	..	..	..	..	..	..	..	..	..	..	55	..	..	..	..	..	..	..	..	..	..	..	..
Arkansas	60	56	32	48	52	56	70	48	20	..	60	50	..	57	57	..	60	60	50	24	33	..	56	..	50	60	14	..	60
California	60	54	32	50	40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Colorado	60	56	32	48	52	..	70	50	..	..	60	..	..	57	..	..	60	..	..	..	..	..	..	44	..	45	14	..	60
Connecticut	60	56	32	48	48	..	..	50	20	..	60	54	50	52	50	60	60	60	48	25	33	..	55	..	..	..	..	..	60
Delaware	60	..	..	..	..	..	..	48	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dist. Col	60	..	..	..	..	..	..	..	..	..	60	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Florida	60	56	32	48	..	56	70	48	20	..	60	60	..	56	54	..	60	..	48	24	..	48	..	..	50	..	..	..	..
Georgia	60	56	32	47	52	56	70	48	20	..	60	55	..	57	55	..	60	60	..	24	33	..	56	44	..	45	14	..	60
Hawaii	60	56	32	48	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Idaho	60	56	36	48	42	..	..	..	..	..	60	..	..	..	..	..	..	..	45	28	28	..	56	..	..	..	..	..	60
Illinois	60	56	32	48	52	56	70	48	20	38	60	50	..	57	55	..	60	..	..	24	33	46	56	44	..	45	14	..	60
Indiana	60	56	32	48	50	56	68	50	..	35	60	55	..	48	55	..	60	..	..	25	33	46	..	44	50	45	14	..	60
Iowa	60	56	32	48	52	56	70	..	20	..	60	46	..	57	..	..	60	..	48	24	33	46	56	44	50	45	14	50	60
Kansas	60	56	32	48	50	..	70	50	20	32	60	50	..	57	55	..	60	..	48	24	33	46	56	44	50	45	14	50	60
Kentucky	60	56	32	47	56	56	70	50	20	..	60	55	..	57	60	..	60	60	..	24	..	45	56	44	50	45	14	50	60
Louisiana	60	56	..	48	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Maine	60	50	32	48	48	..	..	50	..	..	60	..	50	52	50	60	60	60	44	..	..	..	..	..	..	..	..	..	..
Maryland	..	..	26	..	..	..	..	..	..	..	56	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Massachusetts	60	56	32	48	48	50	..	50	20	..	60	54	50	52	..	..	60	60	48	25	..	..	55	..	..	45	..	..	60
Michigan	60	56	32	48	48	56	70	50	..	..	60	56	..	54	58	..	60	60	48	22	..	46	56	44	50	45	14	50	60
Minnesota	60	56	32	48	50	56	70	..	..	..	60	55	45	52	..	50	60	60	50	28	..	..	..	50	48	45	14	48	60
Mississippi	60	56	32	48	48	56	72	48	20	38	60	60	..	57	55	..	60	60	..	26	..	46	56	44	50	45	14	50	60
Missouri	60	56	32	48	52	56	70	50	20	38	60	56	50	57	42	..	60	60	48	24	..	46	56	44	50	45	14	48	60
Montana	60	56	32	48	52	56	70	50	20	30	60	..	50	57	..	50	60	60	45	..	..	..	56	44	..	45	14	50	60
Nebraska	60	56	32	48	52	56	70	50	20	30	60	50	..	57	55	..	60	60	..	24	..	46	56	44	50	45	14	50	60
Nevada	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
New Hampshire	60	56	32	..	..	..	..	50	..	..	60	..	..	..	..	..	62	60	..	..	..	..	..	..	..	..	..	..	..
New Jersey	60	56	30	48	50	..	..	..	..	..	60	54	..	57	..	..	60	60	50	25	..	..	55	..	..	..	..	..	64
New Mexico	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
New York	60	56	32	48	48	..	..	50	20	..	60	54	50	57	..	..	60	60	48	25	..	..	55	..	..	45	..	..	60
North Carolina	60	56	32	48	50	..	..	48	..	..	..	..	..	..	..	..	..	60	..	..	..	..	55	..	..	..	..	..	60
North Dakota	60	56	32	48	42	56	70	..	20	..	60	46	..	52	60	60	60	60	50	..	..	..	56	..	50	45	..	..	60
Ohio	60	56	32	48	50	56	68	..	..	34	60	50	50	55	60	56	60	60	50	24	..	..	56	44	50	45	..	50	60
Oklahoma	60	56	32	48	42	56	70	..	20	..	60	46	..	52	60	60	60	60	..	..	..	..	56	..	..	42	..	..	60
Oregon	60	56	32	46	42	..	..	..	..	..	60	..	..	..	..	..	..	..	45	28	..	..	..	..	..	..	..	..	60
Pennsylvania	60	56	32	47	48	..	..	..	..	..	56	..	..	50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	60
Rhode Island	60	56	32	48	48	56	70	50	20	38	60	54	50	50	50	50	60	60	48	25	..	46	56	44	50	45	..	50	60
South Carolina	..	..	..	..	..	..	..	48	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
South Dakota	60	56	32	48	42	56	70	..	20	..	60	46	..	52	60	60	60	60	..	..	..	..	56	..	..	42	..	..	60
Tennessee	60	56	32	48	50	56	70	48	20	..	60	50	50	56	50	50	60	60	50	24	..	46	56	44	50	45	14	48	60
Texas	60	56	32	48	42	56	70	..	20	..	60	55	..	57	55	..	60	..	45	28	..	..	56	44	50	45	..	48	60
Utah	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Vermont	60	56	32	48	48	56	..	..	..	..	60	..	50	52	60	60	62	60	46	..	..	..	..	..	..	45	..	..	60
Virginia	60	56	30	48	52	56	70	50	..	38	56	56	..	57	55	..	60	60	..	28	32	..	56	44	50	45	14	48	60
Washington	60	56	32	48	42	..	..	..	..	..	60	..	..	..	..	..	..	..	45	28	..	..	56	..	..	..	..	..	60
West Virginia	60	56	32	48	52	..	..	..	..	..	60	..	..	..	..	..	60	..	..	25	..	..	56	..	..	45	..	..	60
Wisconsin	60	56	32	48	50	..	..	50	20	34	60	54	50	57	42	50	60	60	50	25	..	..	56	44	50	45	..	48	60
Wyoming	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

NOTE.— Rye meal takes 48 pounds to the bushel in the District of Columbia and 50 in Maine, Massachusetts, New York, Rhode Island, and Wisconsin. Peeled dried peaches take 38 pounds to the bushel in Alabama and 40 in Virginia. The metric system is used in the Philippines and Porto Rico.

STEAM PRESSURE AND TEMPERATURE.

Pressure in Lbs. per Sq. In.	Corresponding Temperature, Fahrenheit.	Pressure in Lbs. per Sq. In.	Corresponding Temperature, Fahrenheit.	Pressure in Lbs. per Sq. In.	Corresponding Temperature, Fahrenheit.
10	192.4	65	301.3	140	357.9
15	212.8	70	306.4	150	363.4
20	228.5	75	311.2	160	368.7
25	241.0	80	315.8	170	373.6
30	251.6	85	320.1	180	378.4
35	260.9	90	324.3	190	382.9
40	269.1	95	328.2	200	387.3
45	276.4	100	332.0	210	391.5
50	283.2	110	339.2	220	395.5
55	289.3	120	345.8	230	399.4
60	295.6	130	352.1	240	403.1

TABLE OF TEMPERATURE.

Degree of Fahr.	
2,786	Cast iron melts (Daniell).
1,996	Copper melts (Daniell).
1,947	Gold melts.
1,873	Silver melts (Daniell).
1,750	Brass (containing 25% of zinc) melts (Daniell).
1,000	Iron, bright cherry red (Poillet).
980	Red heat, visible in daylight (Daniell).
941	Zinc begins to burn (Daniell).
773	Zinc melts (Daniell).
644	Mercury boils (Daniell), 662 (Graham).
640	Sulphuric acid boils (Magrignac), 620 (Graham).
630	Whale oil boils (Graham).
617	Pure lead melts (Rudberg).
600	Linseed oil boils.
518	Bismuth melts (Gmelin).
442	Tin melts (Crichton).
380	Arsenious acid volatilizes.
356	Metallic arsenic sublimes.
315	Oil of turpentine boils (Kaure).
302	Etherification ends.
257	Saturated sol. of sal ammoniac boils (Taylor).
256	Saturated sol. of acetate of soda boils.
239	Sulphur melts (Miller), 226 (Fownes).
238	Saturated sol. of nitre boils.
221	Saturated sol. of salt boils (Paris Codex).
220	Saturated sol. of alum, carb. soda, and sulph. zinc, boil.
218	Saturated sol. of chlorate and prussiate potash, boil.
216	Saturated sol. of sulph. iron, sulph. copper, nitrate of lead, boil.
214	Saturated sol. of acetate lead, sulph. and bitartrate potash, boil.
213 or (213.5)	Water begins to boil in glass.
212	Water boils in metal, barometer at 30°.
211	Alloy of 5 bismuth, 3 tin, 2 lead, melts.
201	Alloy of 8 bismuth, 5 lead, 3 tin, melts (Kane).
207	Sodium melts (Regnault).
185	Nitric acid 1.52 begins to boil.
180 (about)	Starch forms a gelatinous compound with water.
176	Rectified spirit boils, benzol distils.
173	Alcohol (sp. gr. .796 to .800) boils.
151	Beeswax melts (Kane), 142 (Lepage).
150	Pyroxylic spirit boils (Scanlan).
145	White of egg begins to coagulate.
141.8	Chloroform, and ammonia of .945, boil.
132	Acetone (pyroacetic spirit) boils (Kane).
122	Mutton suet and styracin melt.
116	Bisulphuret of carbon boils (Graham).
115	Pure tallow melts (Lepage), 92 (Thomson).
112	Spermaceti and stearin of lard melt.
111	Phosphorus melts (Miller).
98	Temperature of the blood.
95	Ether (.720) boils.
95	Carbolic acid crystals become an oily liquid.
88	Acetous fermentation ceases, water boils *in vacuo*.
77	Vinous ferm. ends, acetous ferm. begins.
64.4	Oil of anise liquefies.
59	Gay Lussac's *Alcoomètre* graduated at.
55	Sirups to be kept at.
30 (about)	Olive oil becomes partially solid.
32	Water freezes.
5	Cold produced by snow 2 parts and salt 1 part.
−37.9	Mercury freezes.

—*Cooley.*

APPROXIMATE PERCENTAGE VARIATION IN RESISTANCE AT ABOUT 20° C. (68° F.)

Metal or Alloy.	(a) Per 1° C.	(a) Per 1° F.
Platinum Silver (1 pt. Platinum to 2 pts. Silver), hard or annealed	0.031	0.017
German Silver, hard or annealed	0.044	0.024
Mercury	0.072	0.040
Bismuth, pressed	0.354	0.197
Gold, annealed	0.365	0.203
Zinc, pressed	0.365	0.203
Tin, "	0.365	0.203
Silver, annealed	0.377	0.209
Lead, pressed	0.387	0.215
Copper, annealed	0.428	0.238
Iron (about)	0.5	0.278

—*Practical Engineer's Electrical Pocket-Book and Diary.*

HEAT AND ELECTRICAL CONDUCTIVITY.

Substances.	Heat Conductivity.	Electrical Conductivity.
Silver	100.0	100.0
Copper	73.6	73.3
Gold	53.2	58.5
Brass	23.6	21.5
Zinc	19.9	....
Tin	14.5	22.6
Steel	12.0	....
Iron	11.9	13.0
Lead	8.5	10.7
Platinum	6.4	10.3
Palladium	6.3	....
Bismuth	1.8	1.9

RESISTANCE AND WEIGHT TABLE.

American gauge for cotton and silk-covered and bare copper wire.—The resistances are calculated for pure copper wire.

The number of feet to the pound is only approximate for insulated wire.

No.	Diameter.	Feet per Pound.			Resistance, Naked Copper.			
		Cotton Covered.	Silk Covered.	Naked.	Ohms per 1,000 Feet.	Ohms per Mile.	Feet per Ohm.	Ohms per Pound.
8	.12849	....	....	20	6259	3.3	1600	.0125
9	.11443	....	....	25	.7892	4.1	1272	.0197
10	.10189	....	....	32	.8441	4.4	1185	.0270
11	.09074	....	....	40	1.254	6.4	798	.0501
12	.08081	42	46	50	1.580	8.3	633	.079
13	.07196	55	60	64	1.995	10.4	504	.127
14	.06408	68	75	80	2.504	13.2	400	.200
15	.05707	87	95	101	3.172	16.7	316	.320
16	.05082	110	120	128	4.001	23	230	.512
17	.04525	140	150	161	5.04	26	198	.811
18	.0403	175	190	203	6.36	33	157	1.29
19	.03539	220	240	256	8.25	43	121	2.11
20	.03196	280	305	324	10.12	53	99	3.27
21	.02846	360	390	408	12.76	68	76.5	5.20
22	.02535	450	490	514	16.25	85	61.8	8.35
23	.02257	560	615	649	20.30	108	48.9	13.3
24	.0201	715	775	818	25.60	135	39.0	20.9
25	.0179	910	990	1,030	32.2	170	31.0	33.2
26	01594	1,165	1,265	1,300	40.7	214	24.6	52.9
27	01419	1,445	1,570	1,640	51.3	270	19.5	84.3
28	.01264	1,810	1,970	2,070	64.8	343	15.4	134
29	.01126	2,280	2,480	2,617	81.6	432	12.2	213
30	.01002	2,805	3,050	3,287	103	538	9.8	338
31	.00893	3,605	3,920	4,144	130	685	7.7	539
32	.00795	4,535	4,930	5,227	164	865	6.1	856
33	.00708	....	6,200	6,590	206	1033	4.9	1357
34	.0063	....	7,830	8,330	260	1389	3.8	2166
35	.00561	....	9,830	10,460	328	1820	2.9	3521
36	.005	....	12,420	13,210	414	2200	2.4	5469

WEIGHT IN POUNDS PER MILE OF COPPER WIRE.

Number.	Roebling.	Birmingham.	Brown & Sharpe.	English Legal Standard.	Number.	Roebling.	Birmingham.	Brown & Sharpe.	English Legal Standard.
0000	2,466	3,286	3,375	2,555	14	102	110	65	102
000	2,092	2,884	2,677	2,210	15	83	83	52	83
00	1,750	2,305	2,123	1,933	16	64	68	41	65
0	1,504	1,846	1,684	1,682	17	47	53¾	33	50
1	1,278	1,437	1,335	1,437	18	35	38	26	37
2	1,104	1,287	1,058	1,216	19	27	28	20¾	26
3	950	1,071	839	1,012	20	19½	19½	16¼	20¾
4	808	904	665	860	21	16¼	16¼	13	16¼
5	684	773	528	718	22	12½	12½	10¼	12½
6	588	657	418	588	23	10¼	10¼	8¼	9¾
7	500	517	332	495	24	8¼	7¾	6½	7¾
8	419	435	263	409	25	6½	6½	5⅛	6½
9	350	350	209	332	26	5	5	4	5
10	291	287	166	263	27	4½	4	3¼	4
11	230	230	131	215	28	4	3¼	2½	3½
12	176	190	104	173	29	3⅝	2⅝	2	3
13	135	144	83	135	30	3¼	2¼	1⅝	2½

WIRE GAUGES, IN DECIMAL PARTS OF AN INCH.

Number of Wire Gauge.	Roebling.	Brown & Sharpe.	Birmingham or Stubs.	English Legal Standard.	Old English, or London.
000000	0.46	......	......	0.464	......
00000	0.43	......	......	0.432	......
0000	0.393	0.46	0.454	0.4	0.454
000	0.362	0.40964	0.425	0.372	0.425
00	0.331	0.3648	0.380	0.348	0.38
0	0.307	0.32495	0.340	0.324	0.34
1	0.283	0.2893	0.3	0.3	0.3
2	0.263	0.25763	0.284	0.276	0.284
3	0.244	0.22942	0.259	0.252	0.259
4	0.225	0.20431	0.238	0.232	0.238
5	0.207	0.18194	0.22	0.212	0.22
6	0.192	0.16202	0.203	0.192	0.203
7	0.177	0.14428	0.18	0.176	0.18
8	0.162	0.12849	0.165	0.16	0.165
9	0.148	0.11443	0.148	0.144	.148
10	0.135	0.10189	0.134	0.128	0.134
11	0.12	0.09074	0.12	0.116	0.12
12	0.105	0.08081	0.109	0.104	0.109
13	0.092	0.07196	0.095	0.092	0.095
14	0.08	0.06408	0.083	0.08	0.083
15	0.072	0.05706	0.072	0.072	0.072
16	0.063	0.05082	0.065	0.064	0.065
17	0.054	0.04525	0.058	0.056	0.058
18	0.047	0.0403	0.049	0.048	0.049
19	0.041	0.03589	0.042	0.04	0.04
20	0.035	0.03196	0.035	0.036	0.035
21	0.032	0.02846	0.032	0.032	0.0315
22	0.028	0.02534	0.028	0.028	0.0295
23	0.025	0.02257	0.025	0.024	0.027
24	0.023	0.0201	0.022	0.022	0.025
25	0.02	0.0179	0.02	0.02	0.023
26	0.018	0.01594	0.018	0.018	0.0205
27	0.017	0.01419	0.016	0.0164	0.01875
28	0.016	0.01264	0.014	0.0148	0.0165
29	0.015	0.01125	0.013	0.0136	0.0155
30	0.014	0 01002	0.012	0.0124	0.01375
31	0.0135	0.00893	0.010	0.0116	0.01225
32	0.013	0.00795	0.009	0.0108	0.01125
33	0.011	0.00708	0.008	0.01	0.01025
34	0.01	0.0063	0.007	0.0092	0.0095
35	0.0095	0.00561	0.005	0.0084	0.009
36	0.009	0.005	0.004	0.0076	0.0075

TABLE INDICATING SIZE, WEIGHT, AND LENGTH OF IRON AND STEEL WIRE.

Gauge Numbers.	Diameter, Ins.	W'ight of 100 Feet. Lbs.	W'ight of One Mile, Lbs.	Feet in 2000 Lbs.	Area, Square Ins.
3-0	.362	34.73	1834	5,759	.102921
2-0	.331	29.04	1533	6,886	.086049
1-0	.307	25.00	1318	8,000	.074023
1	.283	21.23	1121	9,425	.062901
2	.263	18.34	968	10,905	.054325
3	.244	15.78	833	12,674	.046759
4	.225	13.39	707	14,936	.039760
5	.207	11.35	599	17,621	.033653
6	.192	9.73	514	20,555	.028952
7	.177	8.30	439	24,906	024605
8	.162	6.96	367	28,734	.020612
9	.148	5.80	306	34,483	.017203
10	.135	4.83	255	41,408	.014313
11	.120	3.82	202	52,356	.011309
12	.105	2.92	154	68,493	.008659
13	.092	2.24	118	89,286	.006647
14	.080	1.69	89	118,343	.005026
15	.072	1.37	72	145,985	.004071
16	.063	1.05	55	190,476	.003117
17	.054	0.77	41	259,740	.002290
18	.047	0.58	31	344,827	.001734
19	.041	0.45	24	444,444	.001320
20	.035	0.32	17	625,000	.000962
21	.032	0.27	14	740,741	.000804
22	.028	0.21	11	952,381	.000615
23	.025	0.175	9.24	......	.000491
24	.023	0.140	7.39	......	.000415
25	.020	0.116	6.124	......	.000314
26	.018	0.093	4.91	......	.000254
27	.017	0.083	4.382	......	.000227
28	.016	0.074	3.907	......	.000201
29	.015	0.061	3.22	......	.000176
30	.014	0.054	2.851	......	.000154
31	.0135	0.050	2.64	......	.000143
32	.013	0.046	2.428	......	.000132
33	.011	0.037	1.953	......	.000095
34	.010	0.030	1.584	......	.000078
35	.0095	0.025	1.32	......	.000071
30	.009	0.021	1.161	......	.000064

LINEAR EXPANSION OF SOLIDS AT ORDINARY TEMPERATURES.

Substance.	For 1° Fahr.	For 1° Cent.
	Length = 1.	Length = 1.
Aluminium (cast)	.00001234	.00002221
Antimony (cryst.)	.00000627	.00001129
Brass, cast	.00000957	.00001722
" English plate	.00001052	.00001894
" sheet	.00001040	.00001872
Brick, best stock	.00000310	.00000550
Bronze (Baily's). Copper, 17. Tin, 2½. Zinc, 1.	.00000986	.00001774
"	.00000975	.00001755
Cement, Roman, dry	.00000797	.00001435
Cement, Portland (mixed), pure	.00000594	.00001070
Cement, Portland, mortar, with sand	.00000656	.00001180
Concrete: cement mortar and pebbles	.00000795	.00001430
Copper	.00000887	.00001596
Ebonite	.00004278	.00007700
Glass, English flint	.00000451	.00000812
" French flint	.00000484	.00000872
" white, free from lead	.00000492	.00000886
" blown	.00000498	.00000896
" thermometer	.00000499	.00000897
" hard	.00000397	.00000714
Granite, gray, dry	.00000438	.00000789
" red "	.00000498	.00000897
Gold, pure	.00000786	.00001415
Iridium, pure	.00000356	.00000641
Iron, wrought	.00000648	.00001166
" Swedish	.00000636	.00001145
" cast	.00000556	.00001001
" soft	.00000626	.00001126
Lead	.00001571	.00002828
Marble, moist	.00000663	.00001193
" dry	.00000363	.00000654
" white Sicilian, dry	.00000786	.00001415
Marble, black Galway	.00000308	.00000554
" Carrara	.00000471	.00000848
Masonry, of brick in cement mortar: headers	.00000494	.00000890
Masonry, of brick in cement mortar: stretchers	.00000256	.00000460
Mercury (cubic expansion)	.00009984	.00017971
Nickel	.00000695	.00001251
Osmium	.00000317	.00000570
Palladium, pure	.00000556	.00001000
Pewter	.00001129	.00002033
Plaster, white	.00000922	.00001660
Platinum	.00000479	.00000863
Platinum, 90 per cent. Iridium, 10 per cent., hammered and annealed	.00000476	.00000857
Platinum, 85 per cent. Iridium, 15 per cent.	.00000453	.00000815
Porcelain	.00000200	.00000360
Quartz, parallel to major axis, t 0° to 40° C.	.00000434	.00000781
Quartz, perpendicular to major axis, t 0° to 40° C.	.00000788	.00001419
Quartz, cubic expansion at 16° C.	.00001924	.00003463
Silver, pure	.00001079	.00001943
Slate	.00000577	.00001038
Steel, cast	.00000636	.00001144
" tempered	.00000689	.00001240
Stone (sandstone), dry	.00000652	.00001174
Stone (sandstone), Rauville	.00000417	.00000750
Stone (sandstone), Caen	.00000494	.00000890
Tin	.00001163	.00002094
Wedgwood ware	.00000489	.00000881
Wood, pine	.00000276	.00000496
Zinc	.00001407	.00002532
Zinc, 8. Tin, 1.	.00001496	.00002692

—Clark's Mechanical Engineer's Pocket Book.

EXPANSION OF LIQUIDS.

The cubical expansion, or expansion of volume, of water, from 32° F. to 212° F. and upwards, is given in the following Table. The rate of expansion increases with the temperature. The expansion for the range of temperature from 32° to 212° is .0466, or fully 4½ per cent. of the volume at 32°; or an average of .000259 per degree, or $\frac{1}{3863}$ part of the volume at 32° F.

Expansion of Liquids from 32° to 212° F.
Volume at 32° = 1.

Liquid.	Volume at 212°.	Expansion.
Alcohol	1.1100	$\frac{1}{9}$
Nitric acid	1.1100	$\frac{1}{9}$
Olive oil	1.0800	$\frac{1}{12}$
Turpentine	1.0700	$\frac{1}{14}$
Sea water	1.0500	$\frac{1}{20}$
Water	1.0466	$\frac{1}{22}$
Mercury	1.018	$\frac{1}{55}$

SMEATON DIVING BELL.

AREA OF CIRCLES IN SQUARE FEET.

Diameter.	TENTHS OF INCHES.									
	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	AREA—SQUARE FEET.									
Inches.										
1	0.006	0.007	0.008	0.009	0.011	0.012	0.014	0.016	0.018	0.020
2	.022	.024	.026	.029	.031	.034	.037	.040	.043	.046
3	.049	.052	.056	.059	.063	.067	.071	.075	.079	.083
4	.087	.092	.096	.101	.106	.111	.115	.121	.126	.131
5	.136	.142	.147	.153	.159	.165	.171	.177	.184	.190
6	.196	.203	.210	.216	.223	.230	.238	.245	.252	.260
7	.267	.275	.283	.291	.299	.307	.315	.323	.332	.340
8	.349	.358	.367	.376	.385	.394	.403	.413	.422	.432
9	.442	.452	.462	.472	.482	.492	.503	.513	.524	.535
10	.545	.556	.568	.579	.590	.601	.613	.625	.636	.643
11	.660	.672	.684	.697	.709	.721	.734	.747	.760	.772
12	.785	.799	.812	.825	.839	.852	.866	.880	.894	.908
13	.922	.936	.950	.965	.979	.994	1.009	1.024	1.039	1.054
14	1.069	1.064	1.100	1.115	1.131	1.147	1.163	1.179	1.195	1.211
15	1.227	1.244	1.260	1.277	1.294	1.310	1.327	1.344	1.362	1.379
16	1.396	1.414	1.431	1.449	1.467	1.485	1.503	1.521	1.539	1.558
17	1.576	1.595	1.614	1.632	1.651	1.670	1.689	1.709	1.728	1.748
18	1.767	1.787	1.807	1.827	1.847	1.867	1.887	1.907	1.928	1.948
19	1.969	1.990	2.011	2.032	2.053	2.074	2.095	2.117	2.138	2.160
20	2.181	2.204	2.226	2.248	2.270	2.292	2.315	2.337	2.360	2.383
21	2.405	2.428	2.451	2.475	2.498	2.521	2.545	2.568	2.592	2.616
22	2.640	2.664	2.688	2.712	2.737	2.761	2.786	2.810	2.835	2.860
23	2.885	2.910	2.936	2.961	2.986	3.012	3.038	3.064	3.089	3.115
24	3.142	3.168	3.194	3.221	3.247	3.275	3.301	3.328	3.355	3.382

Diameter.	Area.	Diameter.	Area.	Diameter.	Area.	Diameter.	Area.	Diameter.	Area.
Inches.	*Sq. ft.*	*Inches.*	*Sq. ft.*	*Inches.*	*Sq. ft.*	*Inches.*	*Sq. ft.*	*Inches*	*Sq. ft.*
25	3.41	32	5.59	39	8.30	46	11.54	53	15.32
26	3.69	33	5.94	40	8.73	47	12.05	54	15.90
27	3.98	34	6.30	41	9.17	48	12.57	55	16.50
28	4.28	35	6.68	42	9.62	49	13.10	56	17.10
29	4.59	36	7.07	43	10.08	50	13.64	57	17.72
30	4.91	37	7.47	44	10.56	51	14.19	58	18.35
31	5.24	38	7.88	45	11.04	52	14.75	59	18.99

PULLING STRENGTH OF MEN AND ANIMALS.

Compiled from a test made by Barnum & Bailey's Circus.

Number.	Description.	Weight of Each in Lbs.	Total Pull in Lbs.	Pull per Unit.	Pull per Pound of Weight.
2	Horses	1,600	3,750	1,875	1.172 lbs.
50	Men	150	8,750	175	1.166 "
100	Men	150	12,000	120	0.8 "
6	Horses	1,800	8,875	1,479	0.822 "
2	Camels	1,800	2,750	1,375	0.764 "
1	Elephant	12,000	8,750	8,750	0.729 "

THE AMERICAN EXPERIENCE TABLE OF MORTALITY.

Age.	Expectation of Life in Years.	Number Dying in Each 1,000.	Age.	Expectation of Life in Years.	Number Dying in Each 1,000.
20	42.20	7.81	60	14.10	26.69
21	41.53	7.86	61	13.47	28.88
22	40.85	7.91	62	12.86	31.29
23	40.17	7.96	63	12.26	33.94
24	39.49	8.01	64	11.67	36.87
25	38.81	8.07	65	11.10	40.13
26	38.12	8.13	66	10.54	43.71
27	37.43	8.20	67	10.00	47.65
28	36.73	8.26	68	9.47	52.00
29	36.03	8.35	69	8.97	56.76
30	35.33	8.43	70	8.48	61.99
31	34.63	8.51	71	8.00	67.67
32	33.92	8.61	72	7.55	73.73
33	33.21	8.72	73	7.11	80.18
34	32.50	8.83	74	6.68	87.03
35	31.78	8.95	75	6.27	94.37
36	31.07	9.09	76	5.88	102.31
37	30.35	9.23	77	5.49	111.06
38	29.62	9.41	78	5.11	120.83
39	28.90	9.59	79	4.74	131.73
40	28.18	9.79	80	4.39	144 47
41	27.45	10.01	81	4.05	158.61
42	26.72	10.25	82	3.71	174.30
43	26.00	10.52	83	3.39	191.56
44	25.27	10.83	84	3.08	211.36
45	24.54	11.16	85	2.77	235.55
46	23.81	11.56	86	2.47	265.68
47	23.08	12.00	87	2.18	303.02
48	22.36	12.51	88	1.91	346.69
49	21.63	13.11	89	1.66	395.86
50	20.91	13.78	90	1.42	454.55
51	20.20	14.54	91	1.19	532.47
52	19.49	15.39	92	.98	634.26
53	18.79	16.33	93	.80	734.18
54	18.09	17.40	94	.64	857.14
55	17.40	18.57	95	.50	1000.00
56	16.72	19.89			
57	16.05	21.34			
58	15.39	22.94			
59	14.74	24.72			

IMPORTANT INFORMATION ABOUT OLD COINS.

The invention and use of coins is attributed to the Lydians, a Greek nation, about 862 B. C., whose money was of gold and silver. The dating of coins was first adopted about the fifteenth century.

OLD COINS. Coins are not always valuable on account of their age. The old Spanish silver coins which passed current in this country from 1700 to 1800 have no premium value, neither do common dates of cents in ordinary condition of 1798, 1802 and 1803, or old Half Dollars of the common dates between the years 1805 and 1835. In America it is the fashion to make up sets of the different coins comprising each year of their issue, in as fine condition as it is possible to obtain them, and it is the demand for the coin by collectors which makes the value.

THE PRICES paid for rare coins are chiefly regulated by their state of preservation, the number of pieces issued of a certain date, and the demand for same. But neither the metal out of which the coin is made, nor the age, has anything to do with the prices paid.

THE PRICES quoted in this book are the prices paid by a prominent dealer for coins in good to proof condition, hence $5.00 to $10.00 means that they will pay anywhere between those prices, according to the condition of the coin. When applied to a cent, one having the date distinct, hair not worn off, and all the letters legible on both sides; applied to a silver coin means a good bold impression; and to a gold coin one that presents a handsome appearance and does not show signs of wear.

NEVER CLEAN A RARE COIN. A somewhat corroded coin is oftentimes more valuable than a cleaned one. The cleaning of a rare coin considerably decreases its value.

CLASSIFICATION OF THE CONDITION OF COINS.

THE STATE OF PRESERVATION OF COINS IS CLASSIFIED AS FOLLOWS:

"PROOF."

Proof coins are especially struck for collectors from polished blanks and dies and finished by hand, which gives them a mirror-like, smooth, reflective surface. The most perfect condition known. The mint makes a small charge for the proof coins, and they can only be had during the year of the issue.

"UNCIRCULATED."

Uncirculated coins are coins struck for circulation. But coins, to be classified as "uncirculated" must be as new and bright as when dropped from the coinage press; a coin that has been in circulation, no matter whether it shows no marks of wear, cannot be classified as uncirculated.

"FINE."

Fine coins are those that have been in circulation and have lost their original mint brightness, but they must not show any scratches or nicks.

"GOOD."

Good coins are those which have seen considerable circulation, but every feature of the coin must show plainly. It must not show any bad scratches or nicks.

"FAIR."

Fair coins are those which are much worn, but on which the design, lettering and date are clearly visible.

"POOR."

Poor coins are those on which the design, lettering and date are almost obliterated. Poor coins, unless of a very rare date, are worth their intrinsic value only.

MUTILATED COINS.

Mutilated coins are those with holes, bad cuts or scratches, or otherwise damaged and are worth their intrinsic value only.

"OVER-DATES."

When a die, made in one year, is used in a later year, by engraving one figure over another, the piece struck therefrom is called an "over-date." For instance, the same die from which the Cents of 1810 were struck was used in 1811, by sinking a 1 over the 0, and portions of the latter figure are plainly visible.

COUNTERFEIT RARE COINS.

COUNTERFEITS OF RARE COINS MAY BE DIVIDED AS FOLLOWS:

"RE-STRIKES."

Re-strikes are pieces made from the original dies, but at a later period than the date on the coin. Among the American coins we find re-strikes of the dollar of 1804, and of the half cents of 1831, 1836 and 1840 to 1849. The re-strikes, of course, do not command near the price of the originals. At present the dies are destroyed after the expiration of each year.

"ALTERED-DATES."

Altered dates are original coins which have been altered or tooled from one date to another, and these may justly be classed as forgeries. The rarer dates of the American coins are at times tampered with; especially the dollars of 1801, which are altered to the 1804. But an altered date can easily be detected by the aid of a good magnifying glass.

"ELECTROTYPES."

The front and back of electrotype coins are made separate and are then stuck together, and they may be easily recognized by the mark on edge showing where the two sides have been joined together. They are also of wrong weight. The electrotypes, as a rule, are not made to deceive the uninitiated, but are simply made as copies of very rare coins, where the two sides have been joined together chased. Electrotypes may generally be split in two with a strong knife.

"CAST COINS."

Casts, made from the original dies, are easily detected by their light weight or thickness. The lettering on cast coins is not as sharp as on struck coins, and the surface has a soft appearance, or else is covered with minute sand holes.

Forgeries struck from false dies are mostly found of the rarer Colonial and U. S. Pieces, also of rare ancient gold and silver coins. They are easily detected by anyone somewhat familiar with rare coins, as the weight of the forgeries is mostly incorrect, and the lettering and design are sharper than on the genuine.

Fine and Perfect U. S. Cents. There are here and there to be found cents of the early dates which have been laid away carefully since the time they were coined. These are sometimes valuable. For instance, for a cent of 1799 in good condition one can get $5; but for a fine cent of the same date, from $15 to $30; and for a perfect cent of 1799, that is as bright and sharp as the day it was coined, $50.

Cleaning. Do not attempt to clean fine coins; they should be handled only on the edge, and kept wrapped carefully in chamois skin or soft tissue paper, or laid on velvet. Gold and silver coins may be rinsed, not washed, in hot water and soap. Copper coins should be placed in sweet oil only to remove grease and dirt; acid and scouring will ruin any coin of value.

"EXPLANATIONS."

THE TERMS USED TO DEFINE THE VARIOUS PARTS OF A COIN.

The principal object represented on a coin is called the Type.

The space between the type and the circumference is called the Field.

The lower portion of the area of a coin beneath the type, and separated from the rest of the field by a horizontal line, is called the Exergue.

Small objects represented either in the field or exergue as adjuncts to the main type are called Symbols.

Portions of a coin which are sunk below the level of the surface are said to be Incuse.

Obverse means the head or face of the coin, or the side having the principal device.

Reverse means the tail, or less important side.

Legend means the reading on the coin.

Flowing Hair denotes the hair flowing loosely at the back of the head.

Liberty Cap denotes a bust supporting a pole on which is mounted a cap of Liberty.

Fillet Head denotes the hair tied in a knot at the back of the head.

Turban Head denotes a head surmounted by a turban inscribed "Liberty."

Dies. A thick die usually has lettering on the edge of the coin; a thin die has none.

First Regular Coinage denotes the first year a coin was issued for circulation. Patterns are coins struck off but not into circulation.

Mint Marks consist of small letters on the coin. O., for New Orleans; D., for Dahlonega; C. C., for Carson City; S., for San Francisco, while those coined at the Philadelphia mint have none.

Arrows and Rays. In the early part of the year 1858, arrow points were added at each side of the date, and rays around the eagle.

Milled Edge. In the early part of 1836 the Half Dollars were coined with lettered edge, and in the latter part with milled or ribbed edge, as they are to-day.

THE MOTTO ON U. S. COINS.

"In God We Trust."

Since the new 1907 issues of $10.00 and $20.00 gold pieces appeared, many are of the belief that all U. S. coins without the motto command a premium. This is not true. The motto was not placed on coins till 1864; the two-cent piece being the first coin bearing the motto. So, of course, all U. S. coins prior to 1864 are without the motto.

WEIGHTS AND FINENESS OF COINS.

A gold dollar weighs 25.8 grains 9/10 pure gold, or 23.22 grains.

An ounce of gold 1000 fine is worth $20.-671834+.

An ounce of silver 1000 fine is worth (coinage value) $1.292929+.

All American gold and silver coins are 9/10, or .900 fine.

A pound sterling weighs 123.274+ grains, 11/12 pure gold, or 113.0016+ grains.

A pound sterling is worth $4.8665635287+.

An ounce of silver, English standard, is .925 fine=444 grains pure silver.

An ounce of silver, American standard, is .969 fine=432 grains pure silver.

An ounce of silver, "fine" standard, is 1.000 fine=480 grains pure silver.

A United States silver dollar weighs 412½ grains .900 fine; contains 371.25 grains pure silver.

A dollar of fractional silver weighs 25 grains =385.80 grains, .900 fine; contains 347.22 grains pure silver.

An English shilling weighs 87.273 grains, .900 fine; contains 80.729 grains pure silver.

The pure gold in gold coins of the United States is worth the face value of the coin.

The alloy in gold coins of the United States is pure silver and copper.

The alloy in silver coins of the United States is pure copper.

U. S. MINT TEST FOR GOLD AND SILVER.

The following is a test for determining whether a coin is good or bad. Use the liquids as near the edge of the coin as possible, as that is the part most worn. A drop of the preparation will have no effect on a genuine coin, while it can be plainly seen on counterfeits. Heavily plated coins should be scraped slightly before testing.

TEST FOR GOLD.

Strong Nitric Acid, 6½ drachms.
Mur. Acid, ¼ drachm, or 15 drops.
Water, 5 drachms.

TEST FOR SILVER.

24 Grains of Nitrate of Silver.
30 Drops Nitric Acid.
Water, 1 ounce.

The above test should conform with diameter, thickness and weight, the test used at the mint.

PREMIUM COIN LIST.

$20.00 GOLD PIECES.

DOUBLE EAGLES.

Coinage commenced in 1849; only one specimen of this date is known.

1881, $20.50 to $21.00—1882, $21.00 to $22.50—1883, $22.00 to $25.00—1884, $21.00 to $25.00—1885, $20.50 to $21.00—1886, $20.50 to $21.00—1887, $21.00 to $22.50—1891, $20.50 to $21.00—1907, Flying eagle, the date in Roman letters —$21.00 to $22.50—Flying eagle, the date in numerals, $20.50—1908, Flying Eagle, commands no premium.

The other dates of the $20.00 gold pieces command no premium.

$10.00 GOLD PIECES.

EAGLES.

Coinage commenced in 1795. None issued in 1802, 1805 to 1837 inclusive. Coined at the Philadelphia, New Orleans, San Francisco, Carson City and Denver mints.

1795, $11.00 to $13.00—1796, $12.00 to $15.00 —1797, small eagle, $15.00 to $20.00—1797, large eagle, $11.00 to $12.00—1798, six stars before Liberty head, $13.00 to $18.00—1798, four stars before Liberty head, $13.00 to $20.00—1799 to 1803, $11.00 to $12.00—1804, $12.00 to $15.00—1838, $10.50 to $12.50—1863 to 1877, $10.25 to $11.00. 1907, without the motto, commands no premium.

$5.00 GOLD PIECES.

Coinage commenced in 1795. None were coined in 1801, 1816 and 1817. Coined at the Philadelphia, New Orleans, San Francisco, Charlotte, N. C., Dahlonega, Ga., Carson City and Denver mints.

1795, Small eagle, $6.50 to $7.50—1795, Large eagle, $10.00 to $20.00—1796, $7.00 to $10.00—1797, small eagle, 15 stars, $10.00 to $18.00—1797, large eagle, 16 stars, $10.00 to $22.00—1798, 1799, 1800, $5.50 to $6.50—1798, small eagle, $20.00 to $30.00—1802 to 1814, turban head, left, $5.25 to $5.75—1815, $75.00 to $100.00—1818, $5.50 to $6.50—1819 and 1832, $8.00 to $18.00—1820, $7.00 to $9.00—1821, $10.00 to $15.00—1822, $75.00 to $100.00—1823, $8.00 to $10.00—1824, $15.00 to $20.00—1825, 1826, 1827, 1830, 1831, 1833, $8.00 to $13.00—1828, $15.00 to $25.00—1829, $15.00 to $25.00—1834, with "E Pluribus Unum" over eagle, $7.50 to $10.00—1834, without "E Pluribus Unum," no premium—1875, $7.50 to $9.00—1876, $5.50 to $6.00—1877, $5.50 to $6.00—1877, $10.00 to $13.00. The dates of $5.00 gold pieces not mentioned in this list do not command a premium.

$4.00—STELLA.

1879, $20.00—1880, $35.00.

$3.00.

1864-65, Indian Head, $4.00 to $5.00—1873, $10.00 to $15.00—1875, $15.00 to $20.00—1876, $5.00 to $10.00—1877, $5.00 to $8.00. $3.50 to $4.00 is paid for $3.00 gold pieces of any date, if in perfect condition. First regular issue, 1854; last, 1889.

$2.50—QUARTER EAGLE.

1796, without stars, $7.50 to $10.00—1796, with stars, $9.00 to $15.00—1797, $9.00 to $15.00—1798, $6.00 to $10.00—1802-4-5-7-8, $3.00 to $5.00—1806, $7.00 to $15.00—1821-24-25-27, $5.00 to $8.00—1826, $10.00 to $30.00—1829-30-31-32-33, $3.00 to $5.00—1834, with "E Pluribus Unum," $4.00 to $6.00. First regular coinage, 1796; none coined 1799, 1800, '01, '08, '09 to '20, '22, '28, '28 bearing little or no premium, 1835 to date.

ONE DOLLAR.

1863, '64 and '65, Indian head, $4.00 to $6.00 —1866, Indian head, $2.50 to $4.00—1875, Indian head, $10.00 to $12.00. Any other dates

from 1849 to date, $2.00 to $3.00. First regular issue, 1849; last, 1889; 1903, Louisiana Purchase. St. Louis gold dollars, $1.75.

U. S. SILVER COINS,

ONE DOLLAR.

The rarest and most desirable coin of the regular mint series is the Silver Dollar of 1804. Of this coin, however, it is necessary that the authenticity should be fully proven, as there are many altered dated in the market, as well as re-strikes made at a later period. 1794, flowing hair, small eagle, $25.00 to $50.00—1795, flowing hair, small eagle, $1.50 to $2.00—1795, '96, Fillet head, small eagle, $1.50 to $2.00—1797, fillet head, small eagle, $1.50 to $2.00—1798, fillet head, 13 stars, small eagle, $2.00 to $2.50—1798, fillet head, 15 stars, small eagle, $2.00 to $3.50—1798, fillet head, 13 stars, large eagle, $1.25 to $1.75—1799, fillet head, 5 stars facing eagle, $1.50 to $2.00—1799, fillet head, 6 stars, $1.25 to $1.75—1800, fillet head, large eagle, $1.25 to $1.75—1801, fillet head, large eagle, $1.25 to $2.00—1802, 1803, $1.25 to $1.50—1804, no originals known —1836, Liberty seated, flying eagle, stars, $4.00 to $7.00—1836, C. Gobrecht's name in field, $15.00 to $25.00—1838, Liberty seated, flying eagle, stars, $25.00 to $40.00—1839, Liberty seated, flying eagle, stars, $25.00 to $35.00—1840, Liberty seated, eagle, $1.15—1851, 1852, $20.00 to $30.00—1854, $2.00 to $3.00—1855, $1.50 to $1.75—1856, 1857, $1.25 to $1.50—1858, $10.00 to $15.00—1900, Lafayette dollar, perfect only, $1.10. First regular coinage, 1794; none coined 1805 to 1835; 1874 to 1877; little or no premium on dates not mentioned except on proofs only, 70c.

TRADE DOLLARS.

Proofs only, 75c. Coinage commenced in 1873; repudiated in 1884. Redeemed in 1887.

HALF DOLLARS.

1794, flowing hair, $2.50 to $4.00—1795, $.60 to $1.00—1796, fillet head, 15 stars, $15.00 to $30.00—1796, 16 stars, $20.00 to $35.00—1797, $20.00 to $35.00—1801, 1802, $2.00 to $3.00—1803, 1805, 55c to 60c—1815, head to left, $1.50 to $2.50—1836, milled edge, not lettered, $1.00 to $2.00—1838, having a small o under the bust and over the date—$25.00 to $50.00—1852, Liberty seated, $1.00 to $2.00—1853, without arrowheads each side of date, or rays back of eagle—$25.00 to $30.00. First regular coinage, 1794; none coined 1798, '99, 1800, 1804, '16, otherwise to date little or no premium on dates not mentioned. 1892, Columbia Half—no premium.

QUARTER DOLLARS.

1796, 1804, fillet head, $1.00 to $2.00—1815, 35c to 50c—1823, head to left, $20.00 to $40.00 —1824, head to left, 50c to 75c—1827, head to left, $30.00 to $50.00—1853, no arrow points at each side of date and no rays around eagle, $3.00 to $4.00—Columbia Isabella, 30c to 40c. First regular coinage, 1796; none coined 1797 to 1803, 1808 to '14, 1817 and '26; otherwise to date little or no premium on dates not mentioned.

TWENTY CENT PIECES.

1877 and 1878, each, $1.50. First Regular coinage, 1875; last, 1878; there is no premium on 1875 and 1876.

DIMES.

1796, fillet head, small eagle, $1.00 to $2.00 —1797, fillet head, 13 and 16 stars, $2.00 to $4.00—1798, fillet head, large eagle, $1.50 to $2.00—1800 and 1802, large eagle, $1.50 to $2.50—1801 and 1803, large eagle, $1.00 and $2.00—1804, large eagle, $4.00 to $10.00—1805 and 1807, large eagle, 25c to 50c—1809 and 1811, turban head, 25c to 50c—1822, turban head, 50c to $1.50—1846, Liberty seated, 25c to 75c. First regular coinage, 1796; none coined in 1799, 1806, '08, '10, '12, '13, '15 to '19 and '26; otherwise to date little or no premium on dates not mentioned.

HALF DIMES—5 CENTS.

1794, flowing hair, $1.00 to $2.00—1795, flowing hair, 50c to $1.00—1796, fillet head, $1.50 to $3.00—1797, fillet head, 13 stars, $1.00 to $2.00—1797, fillet head, 15 and 16 stars, $1.00 to $2.00—1800, fillet head, 50c to $1.00—1801, fillet head, 75c to $1.00—1802, fillet head, $20.00 to $40.00—1803, fillet head, $1.00 to $2.00—1805, fillet head, $2.00 to $3.00—1846, Liberty seated, 75c to $1.00. First regular coinage, 1794; last, 1873; none coined 1798, '99, 1804, '06, to '28; little or no premium on dates not mentioned.

SILVER 3 CENT PIECES.

1863 to 1869, each, 25c to 75c—1870 to 1872, each, 15c to 40c—1873, coinage discontinued, 50c to 75c.

NICKEL 5 CENT PIECES.

1877, $1.00 to $2.00—1878, 10c to 20c—1883, without the word "Cents" does not command a premium.

NICKEL 3 CENT PIECES.

1865 to 1876, proofs only, 5c—1877, 50c to $1.00—1878 to 1889, proofs only, 5c to 10c.

NICKEL CENTS.

1856, flying eagle, $3.00 to $5.00. Nickel cents were coined from 1856 to 1864; from '56 to '58 design was a flying eagle; from '59 to '64 an Indian head; all except 1856 bear no premium.

HALF CENTS.

1793, Liberty, $1.00 to $3.00—1794 and 1795, Liberty cap, 25c to 50c—1796, Liberty cap, $10.00 to $25.00—1795 and 1797, Liberty cap, lettered edge, 25c to $1.00—1797, Liberty cap, thin die, 25c to 50c—1800 fillet head, 5c to 30c—1802, fillet head, 75c to $1.00—1803 to 1809, fillet head, 5c to 15c—1810, turban head, 5c to 15c—1811, turban head, 25c to 75c—1831, 1836, 1840 to 1848, each, $3.00 to $12.00—1849, small date, and 1852, $3.00 to $10.00. All other dates command a small premium.

BRONZE 2 CENTS.

1872, 3c to 15c—1873, 20c to $1.00.

U. S. COPPER CENTS.

1793, flowing hair, chain Ameri, $2.50 to $10.00—1793, flowing hair chain Ameri, $1.50 to $7.00—1793, flowing hair, wreath, $1.50 to $3.50—1793, flowing hair, clover leaf, $2.50 to $10.00—1794, liberty cap, 25c to $1.00—1795, liberty cap lettered edge, 50c to $1.00—1795, liberty cap thin die, 25c to $1.00—1796, liberty cap, 25c to $1.50—1796, fillet head, 25c to $1.50—1797, fillet head, 20c to $1.50—1798, fillet head, 10c to $1.00—1799, fillet head, $5.00 to $20.00—1800, 1801, 1802, 1803, 1807, 5c to 50c—1804, fillet head, $3.00 to $15.00—1805 to 1806, 10c to 75c—1808, turban head to left 12 stars, 15c to $1.00—1808, 13 stars, 10c to 75c—1809, 20c to $2.00—1810-1812, 5c to 25c—1811, 25c to $2.00—1813, 10c to 50c—1814, 13 stars, 2c to 25c—1821, 15 stars, head of Liberty, 3c to 50c—1823, 10c to 75c—1857, 5c to 25c.

SILVER.

(1652) XII. Pence, $20.00—VI. Pence, $20.00—III., but two specimens known, $75.00. The above were coined about the year 1652 (no date on the coin), for New England. The obverse has N. E., and the reverse either XII. or VI. or III. at the top of the coin; otherwise, it is perfectly plain. New England comprised New Hampshire, Massachusetts, Rhode Island and Connecticut.

PINE TREE COINS.

1652, III. Pence, $1.50 to $2.50—1652, VI. Pence, $2.00 to $3.00—1652, XII. Pence (shilling), $3.00 to $6.00.

OAK TREE.

1652, II. Pence, $1.00 to $2.00—1652, III. Pence, $1.50 to $3.00—1652, VI. Pence, $2.00 to $3.00—1652, XII. Pence (shilling), $3.00 to $5.00. These coins come with the dates 1650-1652 and 1662, but were coined for several years without changing the date. Some of them had an oak or willow tree, and they are frequently clipped, and an early series of counterfeits by one Wyatt are plentiful, having fine lines across. The obverse have: A pine or oak tree in centre; the legend: "Masathvsets." The reverse: XII. and date; with legend: "New England. An dom."

SOMMER ISLANDS.

BRASS.

First coin made for America, in memory of Sir George Sommers, who was shipwrecked upon the Bermudas or Sommer Islands in 1612. They are made of copper—shilling, sixpence and threepence. They bear no date, but are supposed to have been coined in 1616. Shilling—ship sailing, running boar, $20.00 to $40.00. Sixpence—ship sailing, running boar, $15.00 to $35.00. Threepence—ship sailing, running boar, $15.00 to $35.00.

LOUISIANA AND CANADA.

SILVER.

1670, Crown, $25.00—1670, half franc, $4.00. These were coined in France for use in their colonies in America, and have on the obverse: "Lud XIIII. D G Fr et Nav Rex;" reverse; "Gloriam Regni Tui Dicent, 1670."

COPPER.

1670, Double L Crowned, $5.00—1721, Two L's crossed, 50c—1722, Two L's crossed, 50c—1767, Two Scepters crossed, 40c.

CAROLINA AND NEW ENGLAND.

COPPER.

1694, Carolina, $20.00—1694, New England, $40.00. The above were coined in England for the colonies. The obverse has an Elephant; the reverse: God preserve New England (or Carolina) and its Lords Proprietors, 1864.

MARYLAND.

SILVER.

XII Pence, Lord Baltimore (1659), $10.00—VI Pence, Lord Baltimore, $10.00—III Pence, Lord Baltimore, $10.00. Obverse: Bust; legend: Coecilivus Dus Terrae, Mariae & Ct. Reverse, a crowned shield. XII Crescite et Mvltiplicamini. No date on coin. Coined in England for and circulated in Maryland about 1659.

1790, III Pence, Standish Barry, $10.00—1783, Shilling, Annapolis, $3.00—1783, Sixpence, Annapolis, $3.00—1783, Three pence, Annapolis, $3.00.

ROSA AMERICANA.

COPPER.

1722, Penny, uncrowned rose, $1.00—1722, ½ Penny uncrowned rose, 25c—1722, Farthing, uncrowned rose, 50c—½ Penny, no date, uncrowned rose, $10.00—Penny, no date, uncrowned rose, $10.00—1723, Penny, crowned rose, $1.50—1723, ½ Penny, crowned rose, 50c—1723, Farthing, crowned rose, 50c—1724, ½ Penny, crowned rose, $10.00—1733, Penny (twopence size), $20.00. The above bears on the obverse a bust; legend: Georgius: D: G: Mag: Bri: Fra: et: Hib: Rex. Reverse: a rose, either crowned or uncrowned; legend: Rosa Americana and date. Some will be found without date. Of English origin and coined for the American colonies.

CONNECTICUT.

COPPER.

1737, Threepence, Connecticut, $25.00—1737, Threepence, I am Good Copper, $25.00. Of the above there are two varieties; one bears the date and the other does not, but both were coined about the same period. The obverse has: A Deer in standing position: Legend: "The Value of Threepence," or "Value me as you please." The reverse: Three crowned hammers: I am good copper 1737 or an Ax. I cut my way through. Circulated in the colonies.

1785, Cent. Auctori Connec, 10c—1786, Cent. Auctori Connec, 10c—1787, Cent. Auctori Connec, 5c—1788, Cent. Auctori Connec, 10c. The obverse of these four bear a bust, either facing right or left: Legend: Auctori Connec or Connect. The reverse Liberty seated "Inde et Lib." (Independence and Liberty.) Coined and circulated in the Colonies after their independence.

FLORIDA.

SILVER.

1760, Half Dollar, $10.00. This has the head of Charles III of Spain on the obverse, and on the reverse a rose.

PITT HALF PENNY.

COPPER.

1766, no stamps, 50c.

VIRGINIA.

1773, Half Dollar, silver, $2.00—1773, Half Penny, copper, 15c—1774, Shilling, silver, $12.00. Obverse, Bust of George III, Coat of Arms 1773, Virginia.

CONTINENTAL COINS.

PEWTER.

1776, Dollar, $3.00. The obverse: Sun blazing on a sun dial; legend: Fugio, Mind your business, Continental Currency and date. Reverse, chain of 13 links; each link has the name of one of the original states upon it; legend: America Congress, We Are One.

NEW YORK.

GOLD.

1787, Doubloon, Nova Eboraca, $100.00. Obverse: Rising sun; legend: Nova Eboraca, Columbia. Reverse: Spread eagle, Unum E Pluribus, 1787.

COPPER.

1786, Non vi virtue vici, $25.00. The obverse has a bust facing to left; legend: Non Vi Virtue Vici. The reverse: Justice seated. Neo Eboracensis and date, 1787, Excelsior $10.00. The obverse has: An Eagle, E Pluribus Unum and date. The reverse: The Coat of Arms of

New York, Excelsior—1787, George Clinton, $50.00. Obverse: Bust Geo. Clinton. Reverse: Arms of New York, date and Excelsior—1787, Nova Eborac, 50c. Obverse: Bust, "Nova Eborac." Reverse: Liberty seated, "Virt et Lib," and date—1778, Non Dependens Status, $10.00—1787, Inimica Tyrannis, $10.00—1787, Neo Eboracus, $15.00—1787, Emunis Columbia, $2.00.

GEORGIA.

COPPER.

1788 Georgius Triumpho, 30c.

VERMONT.

COPPER.

1785, Doubloon, Immune Columbia, $200.00.

SILVER.

1783, Half Dollar U. S. 1000, $100.00—Quarter Dollar, 500, $50.00—1783, Shilling 250, $50.00.

COPPER CENTS.

1783-85, Nova Constallatio, 15c—1786, Nova Constallatio, $5.00. Obverse: An eye; legend: Nova Constellatio. Reverse: U. S. Liberties et Justitia, with date—1785, Immune Columbia, $5.00. Obverse: a bust or an eye; legend: Vermontis Republica and date. Reverse: Justice, seated, Immune Columbia—1785, Vermont Republica, 50c—1786, Vermontensium Republica, 50c. Obverse: An eye, legend: Vermonts Res Publica. Reverse: a hill with trees; legend: Steela Quarta Decima, and date—1786-87-88, Vernon Auctori, 15c. A bust, Vermon Auctori. Reverse: Liberty seated, inde et lib., and date.

KENTUCKY.

SILVER.

1796, Myddleton token, $10.00. The obverse: A group; legend: British Settlements in Kentucky and date. Reverse: Britannia seated on a globe; legend: "Payable by P. P. Mydleton. Coined in England for the colonies.

COPPER.

1796, same in copper, $10.00—1796, same in copper ½ penny, $10.00 (1785), Copper, $1.00. The above have on the obverse fifteen stars forming a triangle. Each star contains a letter, being the initial letters of each State of the Union; legend: E Pluribus Unum. Reverse: A hand holding a scroll. "Unanimity is the strength of society." Coined about 1785 in England, and circulated in the colony. No date.

MASSACHUSETTS.

CENTS AND HALF CENTS.

1776, Half Penny, three heads, $5.00 to $10.00—1787, Half Cent, Indian, Eagle, 25c to 50c—1788, Half Cent, Indian, Eagle, 25c to 75c—1787, One Cent, Indian, Eagle, 10c to 25c—1788, One Cent, Indian, Eagle, 10c to 25c—1787, One Cent, Arrows in left claw $5.00 to $7.00. The obverse: An Indian; legend: Commonwealth. Reverse: An eagle, upon its breast the value of the coin; above its head, Massachusetts; below, the date; olive branch and bunch of arrows in its claws—1788, Cent, $10.00, same but arrows in eagle's right claw.

NEW HAMPSHIRE CENT.

1776, Cedar Tree, American Liberty, $3.00 to $5.00.

NEW JERSEY.

1786, '87, '88, 5c. The obverse: A horse head over a plow; legend: Nova Caesarea and date. Reverse: a shield, E Pluribus Unum—1788, horse head to left, 50c—1786, $10.00.

Same as above but with the date above the beam of the plow, while in the above it appears below the plow. 1786, Justice, Immunis Columbia, $10.00.

UNITED STATES COINS.

1787, Silver, $5.00—1787, Copper cent, 10c. The obverse: Sun blazing upon a sun dial. Fugio and date, "Mind your business." Reverse: A chain of 13 links; in centre: "We are one—United States." The above was the first coin legally authorized by act of Congress of the United States. It is called the Franklin Cent, on account of the legend, "Mind your Business." U. S. A. Bar cent, 50c—1792, Liberty, Parent of Science, $10.00.

WASHINGTON PIECES.

SILVER.

1792, 15 stars, $30.00—1792, no stars, $30.00. Obverse: Bust of G. W.; legend: G. Washington, President, 1792. Reverse: Eagle, stars and no stars, United States of America—1792, Dime, $15.00—1792, Half Dime, $5.00. Obverse: A head (representing Martha Washington); legend: Liberty, Parent of Science and Industry, 1792. Reverse: Eagle, United States of America.

COPPER.

1783, United States (brass), 15c—1783, United States, 15c. Obverse, Bust of Washington; legend: Washington and Independence and date. Reverse: United States and also Unity States. No date, double head, 15c—1791, small eagle cent, 8 stars, $3.00—1792, small eagle, 6 stars, $20.00—1791, large eagle, no stars, $2.00—1792, eagle 13 and 15 stars, $15.00. Bust G. W. legend: Washington, President, and date. Reverse: An eagle holding a scroll in its beak—1791-93, Ship Half Penny, $1.00—1791-93, Ship, Liverpool Penny, $3.00—1795, Grate Cent, 50c—1795, Liberty and Security, 50c. Nearly all the Washington pieces, especially the Cents and Half Dollars, were coined in England as patterns for the American coinage, but the designs were not accepted, as it was considered contrary to the principles of our government to stamp the head of our President upon the National coinage.

CALIFORNIA GOLD AND PRIVATE ISSUES.

$50.00 GOLD PIECES.

1851, Augustus Humbert, octagon, $75.00 to $100.00.

The California gold issues are of considerable interest, including as they do $50 gold pieces, oblong gold pieces of approximately the value of $40, $25 pieces, $16 oblong pieces, $10 pieces, $9.43 oblong pieces, $5 pieces, $2.50 pieces, $1 round and $1 octagon, half dollars round, half dollars octagonal, quarter dollars round, quarter dollars octagonal. The value of these coins varies from 75c to $100. The amount of bullion contained in the coin having a considerable bearing. Carolina and Georgia gold, also Colorado and Oregon gold pieces command considerable premium. There are also gold pieces from Utah and Mormon gold pieces. The whole subject is taken up in detail in Lehrenkrauss's pocket manual and premium coin list, which can be obtained from the publishers at Brooklyn, N. Y. In the same booklet the prices are given of the issues of paper currency. Also, the value of foreign money, both coins and bank notes. The book is sold at the merely nominal price of ten cents, and the Editor acknowledges his indebtedness.

Weights of the U. S. Coins

And the Amounts for Which They are Legal Tender.

GOLD.

Denominations	Weight, Grains	Amount for which a legal tender
Double Eagle, $20	516.	Gold coins of denomination are legal tenders for any amount.
Eagle, $10	258.	
Half Eagle, $5	129.	
Three Dollars	77.4	
Quarter Eagle, $2.50	64.5	
Dollars	25.8	

SILVER.

Denominations	Weight, Grains	Amount for which a legal tender
Standard Dollar	412.5	Unlimited.
Trade Dollar	420.	Demonetized—Not a legal tender
Half Dollars	192.9	Ten dollars.
Quarter Dollars	96.45	Ten dollars.
Twenty-Cent Pieces	77.16	Five dollars.
Dimes	38.58	Ten dollars.
Half-Dimes	19.29	Five dollars.
Three-Cent Pieces	11.52	Five dollars.

MINOR COINS.

Denominations	Weight, Grains	Amount for which a legal tender
Five Cents	77.6	Twenty-five cents.
Three Cents	30.	Twenty-five cents.
Two Cents	96.	Twenty-five cents.
Cents	48.	Twenty-five cents.

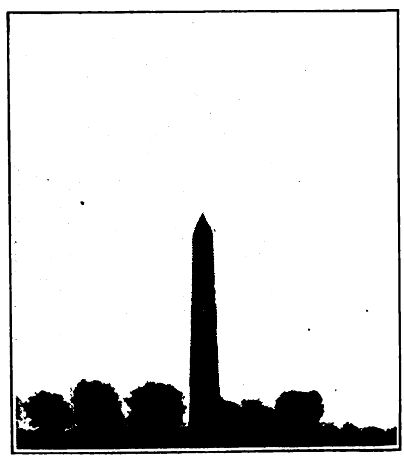
Wedding Anniversaries.

1st year....................Paper
2d " ....Calico
3d " ....Muslin
4th " ....Silk
5th " ....Wood
6th " ....Iron
7th " ....Copper
8th " ....Bronze
9th " ....Pottery
10th " ....Tin
15th " ....Rock-crystal
20th " ....China
25th " ....Silver
30th " ....Pearl
35th " ....Coral
40th " ....Ruby
45th " ....Sapphire
50th " ....Gold
55th " ....Emerald
60th " ....Diamond
75th " ....Diamond

Birth Stones.

Month. Stone.
January.....Garnet
February....Amethyst, Hyacinth, Pearl
March.......Jasper, Bloodstone
April........Diamond, Sapphire
May.........Emerald, Agate
June.........Cat's-eye, Turquoise, Agate
July.........Turquoise, Onyx
August......Sardonyx, Carnelian, Moonstone, Topaz
September...Chrysolite
October.....Beryl, Opal
November...Topaz, Pearl
December....Ruby, Bloodstone
Courtesy of Tiffany & Co.

THE EIFFEL TOWER.



WASHINGTON MONUMENT.

Photographed to scale: 1 inch=500 feet.

THE "STEEL AGE" AND THE "STONE AGE."

STATE HOLIDAYS, NICKNAMES AND FLOWERS.*

STATE OF ALABAMA.

January 1, New Year's Day; January 19, Robert E. Lee's Birthday; February 22, Washington's Birthday; April 13, Thomas Jefferson's Birthday; April 26, Memorial Day; June 3, Jefferson Davis' Birthday; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day; Tuesday before Ash Wednesday, "Mardi Gras Day."

State Nickname: "Cotton State."
State Flower: Goldenrod.

STATE OF ARIZONA.

January 1, New Year's Day; February 14, Admission Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day; every Saturday after 12 o'clock for State and county officers during June, July and August; every day on which an election is held throughout the State; every day appointed by the President of the United States, or the Governor of the State, as a public fast, thanksgiving, or holiday.

State Flower: Sequoia Cactus.

STATE OF ARKANSAS.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Bear State."
State Flower: Apple Blossom.

STATE OF CALIFORNIA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; September 9, Admission Day; October 12, Columbus Day; December 25, Christmas Day; every day on which an election is held throughout the State; every day appointed by the President of the United States, or by the Governor of the State, for a public fast, thanksgiving, or holiday. Every Saturday from 12 o'clock noon until 12 o'clock midnight is a holiday as regards the transaction of business in the public offices of the State.

State Nickname: "Golden State."
State Flower: Golden Poppy.

STATE OF COLORADO.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Decoration Day; July 4, Independence Day; August 1, Colorado Day; 1st Monday in September, Labor Day; October 12, Columbus Day; (one) day in November, Election Day; December 25, Christmas Day.

State Nickname: "Centennial State."
State Flower: Columbine.

DISTRICT OF COLUMBIA.

January 1, New Year's Day; February 22, Washington's Birthday; March 4, Inauguration Day, every fourth year; May 30, Memorial Day; July 4, Independence Day; the first Monday in September, Labor Day; Thanksgiving Day; December 25, Christmas Day.

STATE OF CONNECTICUT.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday of September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; the day designated by the Governor as a day of fasting and prayer, customarily Good Friday; the day designated by the Governor as a day of Thanksgiving, customarily the last Thursday of November.

State Nickname: "Nutmeg State."
State Flower: Mountain Laurel.

STATE OF DELAWARE

January 1, New Year's Day; February 12, Lincoln's Birthday; third Tuesday of February, Election Day; February 22, Washington's Birthday; Good Friday; May 30, Memorial Day; July 4, Independence Day; first Monday of September, Labor Day; the first Tuesday after the first Monday of November, Election Day; December 25, Christmas Day; every Saturday after 12 o'clock noon until 12 o'clock midnight; any day appointed or recommended by the Governor of the State or the President of the United States as a day of thanksgiving or fasting and prayer, or other religious observance.

State Nickname: "Blue Hen State."
State Flower: Peach Blossom.

STATE OF FLORIDA.

January 1, New Year's Day; January 19, Robert E. Lee's Birthday; February 22, Washington's Birthday; April 26, Memorial Day; June 3, Jefferson Davis' Birthday; July 4, Independence Day; first Monday in September, Labor Day; General Election Day; Thanksgiving Day; December 25, Christmas Day; in cities or towns where carnival associations are organized for the purpose of celebrating the same, the day in each year known as Shrove Tuesday.

State Nickname: "Peninsular State."
State Flower: Orange Blossom.

STATE OF GEORGIA.

January 1, New Year's Day; February 12, Georgia Day; February 22, Washington's Birthday; April 26, Confederate Memorial Day; June 3, Jefferson Davis' Birthday; July 4, Independence Day; 1st Monday in September, Labor Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day; every day on which an election is held throughout the State; every day appointed by the President of the United States or the Governor of the State, as a public fast or Thanksgiving day, or holiday.

State Nickname: "Cracker State."
State Flower: Cherokee Rose.

STATE OF IDAHO.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Decoration Day; June 15, Idaho Pioneer Day; July 4, Independence Day; first Monday in September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; every day on which an election is held throughout the State, and every day appointed by the President of the United States or by the Governor of the State, for a public fast, thanksgiving, or holiday.

State Flower: Syringa.

STATE OF ILLINOIS.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; Thanksgiving Day; December 25, Christmas Day; in cities of 200,000 inhabitants or more, from 12 o'clock noon to 12 o'clock midnight on Saturday.

State Nickname: "Sucker State."
State Flower: Violet.

STATE OF INDIANA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; Labor Day; Thanksgiving Day; December 25, Christmas Day; the day of any General National or State Election.

State Nickname: "Hoosier State."

STATE OF IOWA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; The day of the general election; Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Hawkeye State."
State Flower: Goldenrod.

STATE OF KANSAS.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; any day recommended by the President of the United States or the Governor of the State as Thanksgiving Day, and any day which may hereafter be declared a legal holiday for the purposes of negotiable instrument act.

State Nickname: "Sunflower State."
State Flower: Sunflower.

STATE OF KENTUCKY.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Blue Grass State."
State Flower: Goldenrod.

STATE OF LOUISIANA.

January 1, New Year's Day; January 8, Anniversary of the Battle of New Orleans; February 22, Washington's Birthday; Good Friday; June 3, Confederate Memorial Day; July 4, Independence Day; December 25, Christmas Day; Thanksgiving Day (as designated by the President); all general election days (in localities where elections are held); Mardi Gras Day (in the Parish of Orleans); first Monday in September, Labor Day; Saturday from 12 noon to 12 midnight (in cities and towns where the population is fifteen thousand or more).

State Nickname: "Pelican State."
State Flower: Magnolia.

STATE OF MAINE.

January 1, New Year's Day (bank holiday only); February 22, Washington's Birthday; April 19, Patriots' Day; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day; every day on which an election is held throughout the State, and every day appointed by the President of the United States, or the Governor of the State, for a public fast or thanksgiving day, or holiday.

State Nickname: "Pine Tree State."
State Flower: Pine Cone and Tassel.

STATE OF MARYLAND.

January 1, New Year's Day; February 22, Washington's Birthday; Good Friday; Arbor and Highway Day; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; September 12, Defenders' Day; October 12, Columbus Day; General Election Day; Congressional Election Day; November 23, Repudiation Day; December 25, Christmas Day; all special days that may be appointed or recommended by the Governor of the State, or the President of the United States as the days of thanksgiving, fasting and prayer or other religious observance, or for the general cessation of business; Saturday half-holidays (in some cities).

State Nickname: "Old Line State."
State Flower: Black Eyed Susan.

STATE OF MASSACHUSETTS.

February 22, Washington's Birthday; April 19, Patriots' Day; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; October 12, Columbus Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Bay State."

STATE OF MICHIGAN.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; Election Days (embracing National, State, County and City Elections); December 25, Christmas Day; any day appointed by the Governor of this State, or the President of the United States, as a day of fasting and prayer or thanksgiving; Saturday afternoons a legal holiday for banks unless voted to the contrary by the directors.

State Nickname: "Wolverine State."
State Flower: Apple Blossom.

STATE OF MINNESOTA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; Good Friday; May 30, Memorial Day; July 4, Independence Day; Labor Day; Election Day; December 25, Christmas Day.

State Nickname: "Gopher State."
State Flower: Moccasin.

STATE OF MISSISSIPPI.

January 1, New Year's Day; January 19, Robert E. Lee's Birthday; February 22, Washington's Birthday; April 26, Memorial Day; June 3, Jefferson Davis' Birthday; July 4, Independence Day; first Monday in September, Labor Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Bayou State."
State Flower: Magnolia.

STATE OF MISSOURI.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; any general State election day; any Thanksgiving Day appointed by the President of the United States or by the Governor of

the State; December 25, Christmas Day; every Saturday from 12 o'clock noon in cities of 300,000 population for county and municipal officers.
State Flower: Goldenrod

STATE OF MONTANA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; October 12, Columbus Day; December 25, Christmas Day.
State Nickname: "Stub Toe State."
State Flower: Bitter Root.

STATE OF NEBRASKA.

January 1, New Year's Day; February 22, Washington's Birthday; April 22, Arbor Day; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; any day designated by Governor or President, Thanksgiving Day; December 25, Christmas Day.
State Flower: Goldenrod.

STATE OF NEVADA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday of September, Labor Day; October 31, Admission Day; Thanksgiving Day; December 25, Christmas Day; the day on which the primary election is held throughout the State, the day on which the general election is held, any day that may be appointed by the President of the United States, or by Governor of the State, for public fast, thanksgiving or holiday.
State Nickname: "Silver State."

STATE OF NEW HAMPSHIRE.

January 1, New Year's Day; February 22, Washington's Birthday; Fast Day (in April, whenever appointed by the Governor); May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; Thanksgiving Day; December 25, Christmas Day.
State Nickname: "Granite State."

STATE OF NEW JERSEY.

January 1, commonly called New Year's Day; February 12, called Lincoln's Birthday; February 22, known as Washington's Birthday; Good Friday; May 30, known as Decoration Day; July 4, called Independence Day; the first Monday of September, known as Labor Day; October 12, known as Columbus Day; December 25, known as Christmas Day; any general election day in this State; every Saturday from twelve o'clock at noon until twelve o'clock at midnight, and any day appointed or recommended by the Governor of this State, or the President of the United States, as a day of thanksgiving or fasting and prayer, or other religious observance.
State Nickname: "Jersey Blue State."
State Flower: Sugar Maple (tree).

STATE OF NEW MEXICO.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; July 4, Independence Day; October 12, Columbus Day; December 25, Christmas Day; and all days designated by proclamation of the Governor of the State as fast days or thanksgiving days.
State Flower: Cactus.

STATE OF NEW YORK.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday of September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; each general election day and each day appointed by the President of the United States or by the Governor of this State as a day of general thanksgiving, general fasting and prayer, or other general religious observances; from noon to midnight of each Saturday.
State Nickname: "Empire State."
State Flower: Rose.

STATE OF NORTH CAROLINA.

January 1, commonly called New Year's Day; January 19, Robert E. Lee's Birthday; February 22, known as Washington's Birthday; April 12, Halifax Independence Resolutions; May 10, Confederate Memorial Day; May 20, Anniversary of Signing of Mecklenburg Declaration of Independence; July 4, called Independence Day; the first Monday of September, known as Labor Day; Thanksgiving Day; December 25, known as Christmas Day; General Election Day.
State Nickname: "Old North State."

STATE OF NORTH DAKOTA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; Arbor Day; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; Election Day; Thanksgiving Day; December 25, Christmas Day.
State Nickname: "Flickertail State."
State Flower: Goldenrod.

STATE OF OHIO.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Decoration Day; July 4, Independence Day; 1st Monday of September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; any day appointed and recommended by the Governor of the State or the President of the United States as a day of fast or thanksgiving.
State Nickname: "Buckeye State."
State Flower: Scarlet Carnation.

STATE OF OKLAHOMA.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; every day on which an election is held throughout the State; every day appointed by the President of the United States, or by the Governor of the State, for a public fast, thanksgiving or holiday.
State Flower: Mistletoe.

STATE OF OREGON.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday in September; October 12, Columbus Day; December 25, Christmas Day; every day on which election is held throughout the State; every day appointed by the President of the United States, or by the Governor of the State, as a day of public fasting, thanksgiving, or holiday.
State Nickname: "Beaver State."
State Flower: Oregon Grape.

STATE OF PENNSYLVANIA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; Good Friday; May 30, Memorial Day; July 4, Independence Day; 1st

Monday in September, Labor Day; October 12, Columbus Day; 1st Tuesday after 1st Monday in November, Election Day; December 25, Christmas Day; every Saturday after 12 o'clock noon until 12 o'clock midnight; any day appointed or recommended by the Governor of Pennsylvania or the President of the United States as a day of thanksgiving or fasting and prayer, or other religious observance.

State Nickname: "Keystone State."

STATE OF RHODE ISLAND.

January 1, New Year's Day; February 22, Washington's Birthday; 2d Friday in May, Arbor Day; May 30th, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; Tuesday after first Monday in November, Election Day; Last Thursday in November, Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Little Rhody."
State Flower: Violet.

STATE OF SOUTH CAROLINA.

January 1, New Year's Day; January 19, Robert E. Lee's Birthday; February 22, Washington's Birthday; May 10, Confederate Memorial Day; June 3, Jefferson Davis' Birthday; July 4, Independence Day; 1st Monday in September, Labor Day; December 25, Christmas; National Thanksgiving and all general election days; the first Monday in September and Thursday of Fair Week in each and every year, in all the counties in the State in which the State Agricultural Mechanical Society holds an annual Fair. In Charleston and Richland Counties, each and every Saturday from 12 o'clock noon until 12 o'clock at midnight.

State Nickname: "Palmetto State."

STATE OF SOUTH DAKOTA.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; December 25, Christmas Day; and every day on which an election is held throughout the State, and every day appointed by the President of the United States, or by the Governor of the State, for a public fast, thanksgiving, or holiday.

State Nickname: "Swinge Cat State."
State Flower: Anemone Patens.

STATE OF TENNESSEE.

January 1, New Year's Day; February 22, Washington's Birthday; Good Friday; 2d Friday in May, Confederate Day; June 3, Jefferson Davis' Birthday; July 4, Independence Day; 1st Monday in September, Labor Day; last Thursday in November, Thanksgiving Day; December 25, Christmas Day; every day on which an election is held throughout the State, and every day appointed by the President of the United States, or by the Governor of the State, for a public fast, thanksgiving day, or holiday.

State Nickname: "Big Bend State."

STATE OF TEXAS.

January 1, New Year's Day; February 22, Washington's Birthday; March 2, Anniversary of Texan Independence; April 21, Anniversary of Battle of San Jacinto; June 3, Jefferson Davis' Birthday; July 4, Independence Day; first Monday in September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; all days appointed by the President of the United States, or by the Governor, as days of fasting or thanksgiving, and every day on which an election is held throughout the State.

State Nickname: "Lone Star State."
State Flower: Blue Bonnet.

STATE OF UTAH.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; April 15, Arbor Day; May 30, Memorial Day; July 4, Independence Day; July 24, Pioneer Day; first Monday in September, Labor Day; December 25, Christmas Day; all days which may be set apart by the President of the United States, or the Governor of the State, by proclamation, as days of fast or thanksgiving.

State Flower: Sego Lily.

STATE OF VERMONT.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; August 16, Bennington Battle Day; 1st Monday in September, Labor Day; October 12, Columbus Day; December 25, Christmas Day; and a day appointed or set apart by the Governor, or by the President of the United States, as a day of thanksgiving, prayer or other special observance.

State Nickname: "Green Mountain State."
State Flower: Red Clover.

STATE OF VIRGINIA.

January 1, New Year's Day; January 19, Lee-Jackson Day; February 22, Washington's Birthday; May 30, Confederate Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; the Tuesday next following the first Monday in November, Election Day; December 25, Christmas Day; and any day appointed or recommended by the Governor of the State, or the President of the United States, as a day of thanksgiving or fasting and prayer, or other religious observance.

State Nickname: "The Old Dominion."

STATE OF WASHINGTON.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Chinook State."
State Flower: Rhododendron.

STATE OF WEST VIRGINIA.

January 1, commonly called New Year's Day; February 12, called Lincoln's Birthday; February 22, Washington's Birthday; May 30, Decoration Day; July 4, Independence Day; 1st Monday in September, Labor Day; October 12, Columbus Day; Election Day; Thanksgiving Day; December 25, Christmas Day.

State Nickname: "The Panhandle."
State Flower: Rhododendron.

STATE OF WISCONSIN.

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Decoration Day; July 4, Independence Day; Primary Election Day; General Election Day; Thanksgiving Day; December 25, Christmas Day.

State Nickname: "Badger State."
State Flower: Violet.

STATE OF WYOMING.

January 1, New Year's Day; February 12, Lincoln's Birthday; February 22, Washington's Birthday; Arbor Day; May 30, Memorial Day; July 4, Independence Day; General Election Day; Thanksgiving Day; December 25, Christmas Day.

State Flower: Gentian.

OCCURRENCES DURING PRINTING.*

The printing of a volume like the Scientific American Reference Book naturally takes several months. During this time changes are constantly occurring, but it is impossible to go back and make corrections after the book has gone to press; therefore, advantage is taken of inserting in the last "form" whatever corrections and additions are necessary to bring the matter in the book up to date.

POPULATION.—The population of England and Wales (1910) was 36,070,492; the population of London proper was 4,521,685 and Greater London, 7,251,687.

7 hunters were killed and 14 injured in 17 days of the hunting season with only the duck season open. (Page 23.)

Two negroes were lynched in Southern towns on Sept. 26, 1913, one in Litchfield, Ky., and the other in Henchcliffe, Miss. (Page 56); also two negroes were lynched at Harriston, Miss., Sept. 28 after a race battle in which 11 were killed.

FARMS, FOODS AND FORESTS.—Twenty-two states, including Hawaii, now employ state Foresters.

An inspection of hemlock and tamarack ties showed that ties put in track without preservatives were decayed after 5½ years of service; those which had been treated were practically as good as when first laid.

Preliminary reports to the Department of Agriculture for the fiscal year ended June 30, 1913 showed that 57,628,491 animals were slaughtered under Federal inspection, an increase of nearly 5,000,000 over 1912. There were 7,245,585 cattle, 2,277,954 calves, 14,979,354 sheep, 72,871 goats, and 33,052,727 hogs. Slaughtering establishments and meat food factories increased from 919 to 940 in the fiscal year (Page 105.)

COMMERCE.—11,221,624,084 cigarettes were smoked in the United States during the fiscal year ending June 30, 1912. The consumption of whiskey and rum was 133,377,458 gallons and of beer 62,108,733 barrels.

A preliminary report on the internal revenue of the United States shows an increase of $22,208,559.16 for the fiscal year ended June 30, 1913. Of the total increase $6,423,-040.03 came from the corporation tax. The collections exceeded the best previous year, 1911, by $21,898,154.12.

MERCHANT MARINE.—The largest motorship yet constructed is being built for the Standard Oil Company, at Kiel, Germany. It is 420 feet long and 65 feet wide, having a carrying capacity of 15,000 tons.

On Aug. 19 several persons were drowned when the Government steamer Henry Bosse was overturned in a storm in the Mississippi River near Keokuk, Iowa. (Page 219.)

The Hamburg-American Line has laid the keel for the construction of a sister ship to the Imperator to be called the "Vaterland." (Page 203.)

The North-German Lloyd began a regular passenger and freight service between Bremen and Boston and New Orleans on Sept. 17. (Page 204.)

RAILROADS.—A 30,000-foot tunnel costing $10,000,000 is being dug in the Sierra Nevada Mountains by the Harriman System. (Page 263.)

Sept. 6-8. (1912) Dr. Barker covered 1,331 miles in 40 hours, 48 minutes from a camp in the North Carolina Woods to Bar Harbor, Me. (Page 253.)

PANAMA CANAL.—The work of the steam shovels in the bed of the canal has been completed. Dredges will do the rest of the clearing out after water is let in.

WIRELESS.—Up to June 30, 1913 almost 1,300 amateurs had been granted licenses to operate wireless stations.

A wireless communication was sent over 10,000 miles on Sept. 6 as follows: From Wellington to the high power station at Sydney, thence to Perth, and thence via the steamship Australia, in mid-ocean, to Cape Town and Durban.

A wireless telegraph station erected by the Anglo-French Wireless Co., Ltd., for the Bahamas Government, was opened on Aug. 28.

POST OFFICE.—Point Barrow, Alaska, is the northernmost Post office in the United States.

The Post Office Department is the largest business of the Government, practically one out of every one hundred inhabitants of the United States being employed by this department.

NAVY.—The world's record for submarine diving is held by a United States submarine, having reached a depth of 283 feet off Point Diablo, in San Francisco Bay.

ARMY.—In Germany, by recent law, 60,000 men have been added to the colors, and the same number will be added each year until Oct. 1, 1914, when the peace strength will be between 860,000 and 870,000 men. The new three-year service law in France will increase the peace strength from 462,000 to 600,000 men. (Page 395.)

MISCELLANEOUS.—1,000 persons were reported as dead in a typhoon which raged over Japan for several days, beginning Aug. 30.

On Sept. 14, Prof. Malladra took the temperature of Vesuvius, in its depths, and found it to be 625° F. (Page 586).

18 miners perished as a result of a double explosion in a coal mine at East Brookside, on August 2. (Page 86.)

*The latest information given in this book bears date Oct. 1, 1913.

GREATEST EARTHQUAKES AND VOLCANIC ERUPTIONS.

A. D. 79. Eruption of Vesuvius destroyed Pompeii, Herculaneum and Stabiae.

Severe eruptions of Vesuvius occurred in the 5th, 6th and 11th centuries. There was an alarming outbreak in 1631 following a long period of quiet. The 18th century witnessed numerous eruptions. One of the most serious outbreaks of the 19th century was that which took place in 1871-2. There was also a violent eruption in 1906, when some hundreds of lives were lost and great devastation wrought.

1169. Eruption of Mount Etna. Catania and 15,000 of its inhabitants destroyed.

1318. Earthquake in England.

1692. Port Royal, Jamaica, engulfed forty fathoms deep; 3,000 killed.

1693. Earthquake in Sicily; more than 50 towns and cities destroyed. Catania with 18,000 inhabitants totally engulfed. More than 100,000 lives lost.

1755. Great Earthquake in Lisbon; city almost entirely destroyed and more than 40,000 people supposed to have perished.

1822. Aleppo in Syria destroyed by earthquake; more than half its inhabitants killed.

1860. Earthquake in Mendoza, South America, in which many thousands lost their lives.

1868. Disastrous earthquake in Peru and Ecuador; many towns destroyed.

1883. Eruption of Krakatoa, Java; more than 30,000 perished.

1886. Eruption at Talawera, New Zealand, destroying the celebrated "Pink Terraces."

1891. Terrible earthquake in Japan; 300,000 persons homeless.

1902. St. Pierre, Martinique, destroyed by eruption of Mount Pelée; all the inhabitants perished.

1902. Eruption of Mount Soufrière, St. Vincent, destroyed nearly all the buildings in one-third of the island.

1902. Earthquake in Turkestan; the victims numbered 10,000.

1905. Earthquake at Dharmsala, India; native regiment and several Europeans lost; some 10,000 natives killed in Lahore and other places.

1906. Earthquake in Formosa, towns and villages wiped out.

1906. Alarming earthquake in San Francisco, followed by a devastating fire that completed its ruin. 265,000 made homeless; 60,000 buildings destroyed, resulting in a property loss of about $350,000,000.

1906. Earthquake reduced Valparaiso, Chile, to ruins; 3,000 perished.

1907. Earthquake destroyed Kingston, Jamaica; 1,100 persons killed and 2,000 injured.

1908. Earthquake in and around Messina, Sicily; destroyed Messina, Faro, Santa Teresa, Scalleta, Reggio, Gallico, and many other cities and towns. 76,483 persons killed, 95,470 injured and 1,100,000 made homeless.

1910. Earthquake at Cartaga, Costa Rica; 1,500 lives lost.

1912. Earthquake on both sides of the Dardanelles, Turkey; 1,000 killed.

SPARKLESS WIRELESS SYSTEM.

A system of sparkless wireless telegraphy has been invented by a young French engineer, Julien Bethenod, by which it is said to be possible to establish wireless stations in close proximity to one another without the messages being confused and also to exchange communication ten times faster than by submarine cables at about one-tenth the expense. This system necessitates as a plant only an alternator and antennae of a special character. Bethenod's discovery also makes wireless telephony more possible. With a spark, only 2,000 oscillations per second can be produced; by sparkless wireless telephony, 20,000 oscillations can be produced, which is about the same as the human voice.

THE UNITED STATES CIVIL SERVICE.

The United States Civil Service Act approved January 16, 1883, provides for the appointment of three Commissioners, a Chief Examiner, a Secretary, and other employes, by the President, to assist him in classifying the government offices and positions, formulating rules and enforcing the law.

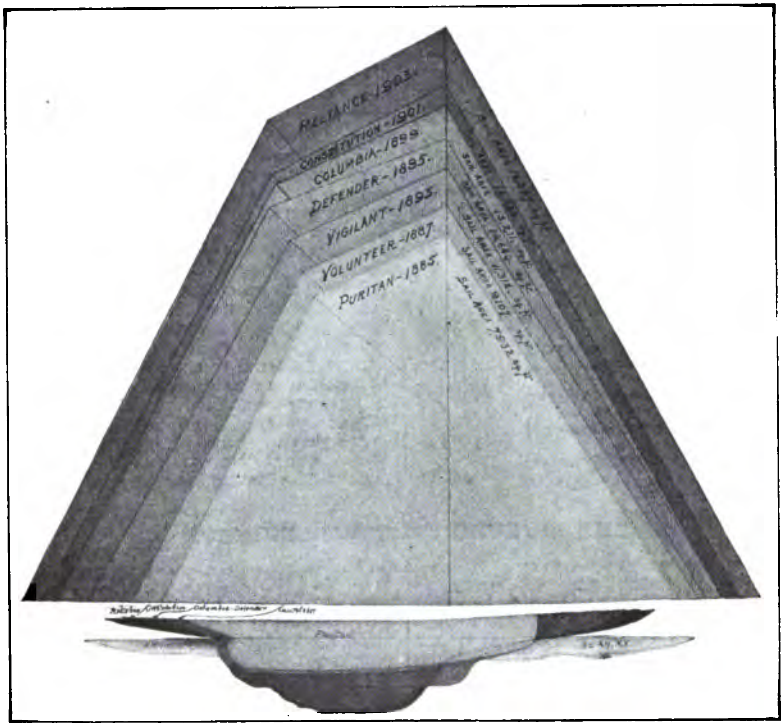
GENERAL RULES.—The purpose of the Civil Service act is "to regulate and improve the Civil Service of the United States." The act requires the rules to provide for free and open examinations of applicants for positions in the public service; that appointments shall be made from those graded highest in competitive examinations; for the apportionment of appointments at Washington among the States upon the basis of population; for a period of probation of six months before any absolute appointment is made.

APPLICATIONS.—All applicants for examinations must be citizens of the United States, and of the proper age. No person will be examined who is physically disqualified for the service which he seeks; who has been guilty of criminal, infamous, dishonest or disgraceful conduct; who is addicted to the use of intoxicating liquors to excess; who has been dismissed from the public service for delinquency and misconduct and who has failed to receive absolute appointment after probation. No discrimination is made on account of race, color, or political or religious opinions.

EXAMINATIONS.—The examinations are opened to all persons qualified as above. The examinations are held twice a year in each State and Territory, before boards of examiners chosen from among persons in government employ. The dates and places of examination are publicly announced through the newspapers or other means. Full information as to rules governing examinations, manner of making application, etc., is given in the "Manual of Examinations," which may be obtained free by writing to the commission in Washington.

APPOINTMENTS.—It is necessary to obtain an average of 70 per cent. to be eligible for appointment. In case of a vacancy, the names of three persons standing highest of the sex desired on the eligible list are given to the appointing officer who chooses any one of the three names, returning the other two to the register to await further consideration. No person can be removed from a competitive position except for such cause as will promote the efficiency of the public service and for reasons given in writing. The salaries vary in the different departments and cannot be given in the short space allotted to the subject.

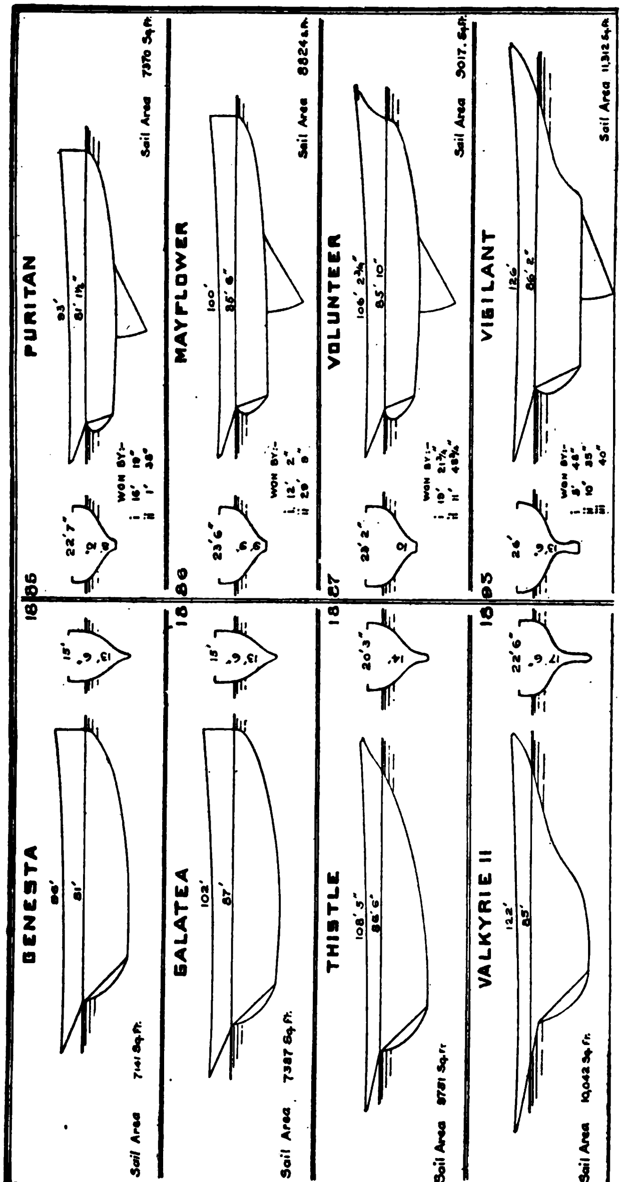
FROM CRUISER TO RACING MACHINE.



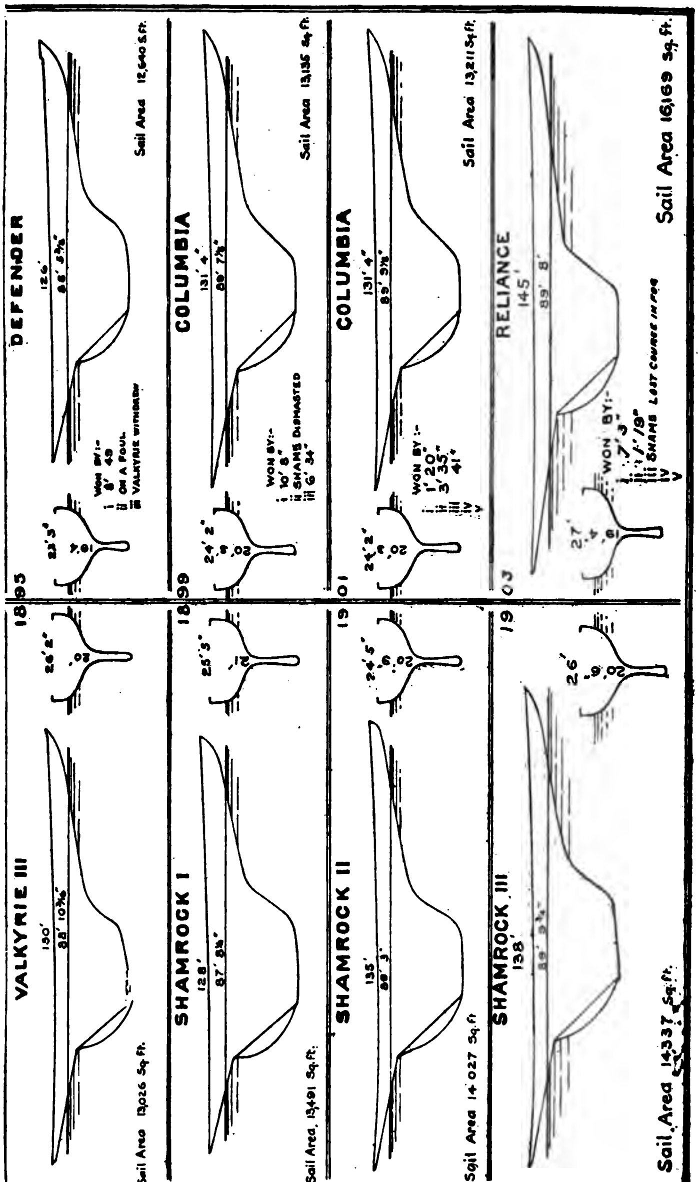
GROWTH OF THE AMERICAN CUP DEFENDER FROM CRUISER TO RACING MACHINE.

THE DEVELOPMENT OF THE 90-FOOT RACING YACHT.

Yachts.	Water-line Length.		Base of Fore Triangle.		Hoist from Boom to Topmast Sheave.		Boom.		Gaff.		Spinnaker Boom.		Total Sail Area.
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	sq. ft.
Puritan	81	1½	62	0	104	0	76	6	47	0	62	0	7,370
Mayflower	85	7	67	0	111	0	80	0	50	0	67	0	8,824
Volunteer	85	10	67	0	111	0	84	0	51	6	67	0	9,107
Vigilant	86	2	69	0	122	0	98	0	57	0	69	0	11,312
Defender	88	5¾	73	3	129	5	106	0	64	10	73	4	12,640
Columbia	89	7¾	73	3	138	5	107	0	64	10	73	4	13,211
Constitution	89	9	78	0	142	0	110	0	72	0	78	0	14,400
Reliance	90	0	84	0	155	0	115	0	72	0	84	0	16,247



DEVELOPMENT OF THE INTERNATIONAL.



RACING YACHT FROM 1885 TO 1903.

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THE FISHING BANKS OF THE NORTH ATLANTIC.

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